AEP

Submitter's Name/Affiliation: American Electric Power Service Corporation
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American Electric Power (AEP) Service Corporation appreciates the opportunity to provide comments on the White Paper. The paper contemplates a mandatory regulatory regime for greenhouse gases. While endorsing neither a mandatory regime nor any of the specific proposals in the White Paper, AEP believes it is important to fully engage and comment on discussions of public policy when requested by the Committee. AEP does not support mandatory greenhouse gas emission caps unless they are part of a binding international agreement that includes both developed and developing countries, such as China and India.

AEP believes that any mandatory U.S. greenhouse gas reduction program should be economy-wide and market-based, and allow for unfettered emissions trading. Emissions trading has been used to achieve significant, cost-effective reductions of sulfur dioxide and nitrogen oxides emissions in the U.S. Part of the success of these programs lies in the inclusion of all major emitting sources. Accordingly, AEP believes that the scope of regulation for greenhouse gases should be economy-wide across all the sectors, lowering the total costs of a greenhouse gas reduction program. Utility CO_2 emissions account for only 35-40% of greenhouse gas emissions in the U.S., so including other significant categories of emitters is very important in minimizing the economic impacts of a mandatory reduction program.

We also believe that "downstream" regulation for electric utilities at the power plant, rather than "upstream" regulation on fossil fuel production, is both more effective and administratively efficient. CO_2 reductions are most likely to occur at power plants, through improved production processes, fuel choices, or control technologies. In addition, electric companies already have continuous emission monitors (CEMs) that report annual CO_2 emissions and are already regulated downstream for SO_2 and NOx emissions, as well as engaging in emissions trading within our sector.

AEP feels strongly that the electric sector should receive emission allowances commensurate with its pro rata share of the emission caps in the legislation, whether emissions are regulated upstream or downstream. There should be no or very limited auctions or set asides of allowances. Because the electric sector is largely cost of service, and more than 80 percent of coal fired generation is currently rate regulated, providing less allowances to electric power companies will simply substantially raise electric rates to consumers.

Non-regulated sources of emissions or offsets should be allowed to opt-in and additional allowances should be created (commensurate with the emissions and/or reduction benefit) in order to capture all cost-effective reductions. AEP also supports providing revenues from the sale of backstop price credits to technology R&D and deployment incentives as well as adaptation assistance.

AEP supports linkage with other systems internationally, both in established markets such as the EU and those emerging in other countries around the world. Linkage will help minimize the costs of greenhouse gas reductions in the U.S. The White Paper appears to contemplate a two-step approach with the U.S. acting first followed by other nations. While not endorsing this approach, and believing a comprehensive binding international agreement is necessary, any alternative approach must include provisions to automatically suspend the program at an early point if other nations do not take similar actions.

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Question 1. Point of Regulation
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Who is regulated and where?

American Electric Power (AEP) does not support a mandatory greenhouse gas (GHG) regulatory program that is contemplated by the White Paper, with the U.S. acting first followed by other nations. AEP does not support mandatory greenhouse gas emission caps unless they are part of a binding international agreement that includes both developed and developing countries, such as China and India. While not endorsing these proposals in the White Paper, AEP believes it is important to fully engage and comment on these questions when requested by the Committee.

If meaningful international commitments are made, and mandatory greenhouse gas emission (GHG) reduction legislation is developed in the U.S., AEP believes it should be a market-based cap and trade system that includes all significant emitting sectors of the U.S. economy. With regard to greenhouse gases and specifically carbon dioxide emissions, no one sector accounts for a majority of U.S. emissions. Instead, greenhouse gas emissions come from multiple sectors with the most significant amounts from electricity generation, transportation, industrial combustion sources, and residential and commercial fuel use.

Therefore, a greenhouse gas regulatory system should not be limited to one sector, such as electric utilities, but be expanded to cover as many source categories as possible. Adopting an economy-wide approach should improve the overall effectiveness of limiting GHG emissions nationally and would expand the opportunities available to achieve those GHG reductions in the least-cost manner. Such an approach also makes the program inherently fairer by spreading the cost burden across the entire economy. It will also make the program less costly by taking advantage of the most cost-effective reductions possible from all major source categories across the economy, rather than arbitrarily limiting reduction obligations (and costs) to electric generation and other large stationary sources. Another related benefit is that an economy-wide program will avoid economic/environmental costs and distortions that could arise by excluding certain sectors. For example, an approach that excludes residential and commercial fuel use from greenhouse gas regulations, but includes electric generation, might bias consumers away from using electric heat and increase use of natural gas by understating the true costs and emission impacts of using natural gas.

Regarding point of regulation, AEP supports a "downstream" system for electric generation and industrial combustion sources (i.e., regulation at the point of emissions). One clear advantage of this approach is that it places the regulation at the point where emission reduction decisions (e.g. fuel choices, efficiency improvements) and production technology choices are made. It also provides incentives for projects that capture and sequester CO2 emissions from the combustion of fossil fuels. In addition, this approach provides administrative efficiencies, since all electric generating units already possess practical experience of being regulated under similar cap and trade systems such as the Acid Rain Program, the NOx SIP Call, and the Clean Air Interstate Rule. Similarly, these same sources are already required to measure and report their CO2 emissions through their continuous emission monitors (CEMs). Industrial combustion

sources, in many cases, also have such practical experience with cap and trade program and monitoring CO2 emissions through CEMS or other accurate monitoring systems.

The workability of a downstream program for electric generation and industrial combustion sources has been demonstrated by the experience in the U.S. with the success of the SO2 and NOx emission trading programs, as well as more recent experience in Europe and elsewhere with CO2 cap and trade systems implemented on large downstream emitters. These downstream systems have been very successful in achieving ambitious reduction targets. Most importantly, they do so while reducing the costs of compliance through emissions trading and the competition among compliance options that it engendered.

For other sectors of the economy, including transportation, off-road mobile sources, and residential and commercial heating, AEP believes that an upstream system (i.e. at the point of production of the fuel used) could have merit, given the administrative and technical difficulties of imposing "downstream" emission caps and associated monitoring and reporting requirements on vehicles, homes and small businesses. However, given the generally higher initial investments associated with more energy-efficient residential heating and vehicle choices, upstream caps on these sectors would need to be coupled with new policy measures for achieving improved performance of these sectors. One such example involves setting efficiency standards for home heating and cooling equipment, building materials and insulation, appliances, and vehicles, to ensure that in the longer term the most cost-effective measures are implemented in these sectors.

Question 1. Point of Regulation
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Question 1a:

- Is the objective of building a fair, simple, and rational greenhouse gas program best served by an economy-wide approach, or by limiting the program to a few sectors of the economy?

See Question 1 response.

Question 1. Point of Regulation
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Question 1b:

- What is the most effective place in the chain of activities to regulate greenhouse gas emissions, both from the perspective of administrative simplicity and program effectiveness?

See Question 1 response.

Question 2. Allocation-AEP
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Should the costs of regulation be mitigated for any sector of the economy, through the allocation of allowances without cost? Or, should allowances be distributed by means of an auction? If allowances are allocated, what is the criteria for and method of such allocation?

American Electric Power (AEP) does not support a mandatory greenhouse gas regulatory program that is contemplated by the White Paper, with the U.S. acting first followed by other nations. AEP does not support mandatory greenhouse gas emission caps unless they are part of a binding international agreement that includes both developed and developing countries, such as China and India. While not endorsing the policy proposals in the White Paper, AEP believes it is important to fully engage and comment on these questions when requested by the Committee.

With regard to the electric generation sector, AEP believes strongly that a high percentage of the allowances (e.g., 95%-100)) should be allocated without cost to electric generators based on their pro rata share of historical greenhouse gas emissions. Moreover, we believe that any proposed cap and trade program for this sector should **not** include any significant auctions (or set-aside of allowances for public benefit purposes) as such measures merely increase the costs of compliance for these sources. If auctions are included, they should only represent minor amounts (i.e. 5% or less) of the total allowance allocation.

Some have argued that there should be significant allowance auctions and fewer allowances should be allocated to electric generation sources. But the underlying analysis of auction programs often assumes that electric generation units participate in a fully deregulated marketplace. This is not at all the case. **In fact, more than 80 percent of coal-fired generation today (which represents 90% of the electric generation sector's CO2 emissions) is subject to cost of service type regulation.[1] These sources should receive their pro rata share of 100 percent of the allowances allocated to this sector based on historical greenhouse gas emissions with no auctioned allowances.** Auctioning allowances rather than allocating them to electric generators will simply increase electricity generating costs and electricity rates unnecessarily. Under cost of service regulation, the cost of auctioned allowance purchases would need to be passed on to the consumer **in addition to** the direct costs of compliance. Under an auction, consumer costs and electricity prices would increase substantially more than under a system with no auctioned allowances.

The following example illustrates the substantial increase in costs resulting from an auction. Suppose a regulated, largely coal-fired utility has 100 million metric tons of annual CO2 emissions, and a 10% greenhouse gas reduction target (i.e. 90 million metric tons). Assume that

[1] **This assessment was based on 2003 state-by-state electricity generation data by fuel from the Energy Information Agency (EIA). Only states in the Northeastern US (New England, NY, PA, MD, DE and DC), Texas and several Western states have fully deregulated generation. A few additional states may move to full deregulation of generation after a transition period. However, most states in transition appear likely to suspend the deregulation process. Also, some deregulated states have recently instituted proceedings to re-regulate prices.**

the average cost of achieving greenhouse gas emission reductions is $7 per ton of CO2 and the price (or marginal cost) of allowances is $10 per ton of CO2.

Case 1: Full Allocation/No Auction

- The utility receives 100% of its target based on historic emissions or 90 MM Allowances without cost. There is no auctioning.
- The utility must reduce its emissions by 10 million tons at a **cost of $70,000,000.** (10MM * $7 per ton).

Case 2: 50% Auction

- The utility receives only 50% of its target based on historic emissions or 45 MM allowances without cost, with the remaining 45 MM allowances auctioned by the federal program.

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- The utility still reduces its emissions by 10 million tons at a cost of $70,000,000, **but** it also must buy 45 MM Allowances at a cost of $450,000,000 per year (45* $10 per ton) which results in **total costs of $520,000,000 per year or more than 7 times higher rate increases/cost increases than in Case 1 with no auction.**

In either case, the utility seeks to recover its total costs from customers through cost-of-service rates. **Thus, in order to minimize the economic cost burden to rate payers and avoid endangering U.S. industry competitiveness, rate impacts should be minimized by allocating the full, pro-rata share of the allowances to electricity generators.**

In addition to much higher electricity rate impacts, substantial auctions will result in a major redistribution of funds through a new government bureaucracy, reducing market efficiency and reducing funds available for companies that need to make the reductions. Investment in compliance technologies will effectively be competing with large scale investments needed by private companies to purchase auctioned allowances. Also, electricity generators already will be making very large investments throughout the next decade to continue to reduce their SO2, NOx and Hg emissions under existing and upcoming Clean Air Act regulatory program.

Finally, the effect of large auctions hurts certain regions of the country disproportionately and unfairly. States and regions in the U.S. that rely more heavily on coal fired power such as North Carolina, Georgia, Ohio, West Virginia, Indiana, Michigan, Kentucky, Tennessee, Iowa, Missouri, Oklahoma, Wisconsin, Minnesota, and most of the Western U.S. will see the largest cost and rate increases due to auctions. Any auction or other allowance allocation scheme thus should be evaluated in light of these disproportionate impacts on coal-reliant states and regions in order to minimize such economic harm on specific states, regions, and the nation as a whole.

Question 2. Allocation-AEP
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Clarifying Questions 2a:

Technology R&D and Incentives

- What level of resources should be devoted to stimulating technology innovation and early deployment?
- What portion, if any, of the revenues from permits or the auction of allowances should be reserved for technology development? If some portion is reserved for this purpose, should that set-aside flow to the federal government with funds spent through the traditional appropriation process? Or should the funds be allocated directly to a non-profit research consortium, chartered by the federal government, which would then administer technology development and deployment projects? Or should there be some combination of these two options?
- What criteria should be used to determine how such funds are spent and which projects are chosen?
- What other mechanisms should be used to promote technology deployment? Options include tax credits, cost-sharing for demonstration projects, assistance to state energy programs, etc.

AEP supports continued investment in technology R&D and deployment and incentives for new cleaner technologies of the future. Effective research, innovation, development and deployment strategies will be a critical long-term measure for achieving a low-carbon energy future. We believe that many of the current incentives in place (e.g. investment tax credits for new clean coal generation, production tax credit for renewable power) should be continued and extended in the future. However, we do not believe it is necessary to set aside significant amounts of allowances or auction allowances for technology R&D. One source for any additional funding should be the revenues raised from purchases of "backstop" emission allowances from the government through the "safety valve" mechanism (as described in earlier legislation introduced by Sen. Bingaman last year).

Question 2. Allocation-AEP
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Questions 2b:

Adaptation Assistance

- What portion of the overall allowance pool should be dedicated to adaptation research or adaptation-related activities?
- How should these allowances or funds be administered?
- What is the appropriate division between federal vs. regional, state, and local initiatives?

AEP believes that adaptation research and assistance are important activities. However, as with technology R&D, we do not believe it is necessary to set aside significant amounts of allowances or auction allowances to fund these activities. Instead, the revenues raised from purchases of "backstop" emission allowances through the "safety mechanism" (as described in earlier legislation introduced by Sen. Bingaman last year) could be used to the extent there are such funding needs.

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Clarifying Questions 2c:

Consumer Protections

- What portion of the overall allocation pool should be reserved to assist consumers?
- Should funds from the sale of permits or allowances be targeted primarily to low-income consumers, or should they be more widely distributed to benefit all consumers?

AEP has and continues to support LIHEAP funding for low-income electricity consumers. However, AEP does not believe that emission allowances should be auctioned or set-aside for electricity consumer protection. Rather, a full allocation of allowances to electric utilities (as described in the Response to Question 2) will help lessen electricity rate impacts to low income customers.

Question 2. Allocation-AEP
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Clarifying Questions 2d:

Set-Aside Programs

- What portion of the allocation pool should be reserved for the early reduction credit program and the offset pilot program?
- Are other set-aside programs needed?

AEP supports the unrestricted use of real and verifiable emission offsets (such as terrestrial sequestration or methane capture from livestock, landfills, coal mines etc.) These offsets are among the lowest cost options available to reduce or sequester greenhouse gases and should be embraced as part of a cost-effective, market based program. However, there is no need or logic for set aside allowances (taken from the overall greenhouse gas emissions cap) to account for these offsets. Instead, emissions offsets generated from activities not covered by the emissions cap should be **in addition to the overall greenhouse gas cap** established by the federal regulatory program**.** As offset projects for terrestrial sequestration, methane capture from landfills or other activities outside of the emissions cap are pursued, new allowances should be created recognizing the net CO2 equivalent benefit of these activities.

Similarly, AEP supports crediting of early reductions or early actions to the extent these reductions are real and verifiable. Similar to some other companies, AEP is already making and registering such reductions through its participation in the Chicago Climate Exchange and EPA Climate Leaders. However, we do not believe that such activities warrant set asides of allowances, but rather could be credited by creating new allowances as described above.

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Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Questions 2e:

Special considerations for fossil-fuel producers?

- Would some upstream fossil fuel producers be unable to pass the cost of purchasing permits or allowances through in fuel prices if they are the regulated entity?
- Is there a sufficient policy rationale for addressing these costs to justify the complexity of setting up and administering an allocation system for these entities?
- What other options exist to address the inability of fossil fuel producers to pass through these costs?

See response to question 2(f)

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Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Questions 2f:

Allocations for downstream electric generators?

- Should electricity generators be included in the allocation if they are not regulated? (Clarification: We mean to ask if an electric generator should be included in the allocation if the greenhouse gas regulation occurs at a point of regulation that is upstream or downstream from the generator, but not the generator itself.)
- What portion of the total allocation should be granted to the electric power sector? Should it be based on the industry's share of greenhouse gas emissions or some other factor?
- Should generators in competitive and cost-of-service markets be treated differently under an allocation scheme?
- How should permits or allowances be distributed within the electric sector? Should it be based on historic emissions? Electricity output? Heat input?

In our response to question 2, we indicated that the full allocation of allowances to electric generators with small or no auctions is the best allocation approach in order to minimize electricity rate impacts to customers and minimize financial impacts on companies. This is true whether or not electric utilities are "carbon regulated". For example, in the event of an "upstream" cap and trade system on the carbon content of coal, coal prices will include the price of CO2 emissions in the fuel (and since all coals have relatively similar carbon content per million Btu of fuel this would be expected to be fully passed through in coal prices). As such, full allocation (based on industry's share of greenhouse gas emissions) will need to go to utilities in order to offset these higher fuel costs and minimize electricity rate impacts to customers. As noted in our response to question 2, to the extent utilities must purchase allowances either from an auction or from other sectors, electricity rate impacts and financial impacts would be substantially greater, with disproportionate economic harm to certain states and regions of the country that rely on coal-fired generation.

Regarding allowance allocation within the power sector, AEP supports a historic emissions approach as the most equitable method of allocation. In this manner, all companies within the sector would be required to make approximately the same percentage reduction below their current or baseline emissions level. (AEP would recommend a multi-year average baseline emissions level in order to correct for high or low demand years due to weather, local economy or other variable factors). Further to afford credit for at least some of the early actions in a companies direct emissions, AEP would propose that companies be allowed to choose an earlier baseline year (e.g. 2000) for purposes of allowance allocation.

AEP opposes output-based allocation systems that provide allowances to non-fossil sources such as nuclear, hydro or renewables. Because they have no CO2 emissions, these sources have no compliance costs under a greenhouse gas reduction program and will benefit from higher power prices to the extent they operate in deregulated markets. For similar reasons,

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Submitter's Name/Affiliation: Dennis Welch, American Electric Power

gas-fired units should not receive allowances **above** their historic emissions. AEP does believe, however, that there is merit for initially a small percentage of allowance allocations being provided to new (i.e. constructed after enactment of any legislation) fossil fuel fired sources based on their actual generating output and the lowest achievable CO2 rate for a fossil source. This will provide appropriate incentives to build new cleaner sources in the future.

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Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Questions 2g:

Allocations for energy-intensive industries?

- Is there a sufficient policy rationale to have an allocation to selected energy-intensive industries? What industries should be included in the allocation?
- What portion of the overall allocation framework should be reserved for these industries?
- What are the appropriate metrics for determining allocations across different industries?

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Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Questions 2h:

Allocations to other industries/entities?

- What other industries/entities (e.g. agriculture, small businesses, etc.) should be considered in the allocation pool?
- What should be the basis for their share of the total allocation as well as for the distribution among such industries/entities?

Question 3. International Linkage-AEP
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Should a U.S. system be designed to eventually allow for trading with other greenhouse gas cap-and-trade systems being put in place around the world, such as the Canadian Large Final Emitter system or the European Union emissions trading system?

American Electric Power (AEP) does not support a mandatory greenhouse gas regulatory program that is contemplated by the White Paper, with the U.S. acting first followed by other nations. AEP does not support mandatory greenhouse gas emission caps unless they are part of a binding international agreement that includes both developed and developing countries, such as China and India. While not endorsing the policy proposals in the White Paper, AEP believes it is important to fully engage and comment on these questions when requested by the Committee.

AEP is very supportive of mechanisms to link any US system with other countries around the world. Extending the GHG markets as broadly as possible is consistent with the global nature of climate change issue. Greater linkage will mean a broader geographical scope of trading, more liquidity, and encourage the most cost-effective reductions of greenhouse gases. This in turn will lower compliance costs and minimize total economic impacts from the program. For example, linkages to offsets programs in developing countries will allow access to less expensive GHG reductions or sequestration, such as through forestry, land use and methane capture. We believe the potential benefits of linkage are substantial and outweigh any potential administrative challenges.

However, specific linkages to current or emerging greenhouse gas trading programs such as the European Union (EU) system, may not be necessary or even advisable in order for the U.S. to realize the benefits of broader international trading. The EU system is a currently a CO2 only system which covers only about half of EU CO2 emissions, so linkage with this system at present may not provide much benefit to the U.S. Instead, unrestricted linkages with international offset project opportunities may offer most of the international cost-effective reduction and trading opportunities. As such, the U.S. program should be designed with possible linkages in mind, but not restricted in any way in order to accommodate these linkages.

Question 3. International Linkage-AEP
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Question 3a:

- Do the potential benefits of leaving the door open to linkage outweigh the potential difficulties?

Question 3. International Linkage-AEP
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Question 3b:

- If linkage is desirable, what would be the process for deciding whether and how to link to systems in other countries?

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Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Question 3c:

- What sort of institutions or coordination would be required between linked systems?

Question 4. Developing Country Participation
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

If a key element of the proposed U.S. system is to "encourage comparable action by other nations that are major trading partners and key contributors to global emissions," should the design concepts in the NCEP plan (i.e., to take some action and then make further steps contingent on a review of what these other nations do) be part of a mandatory market-based program? If so, how?

American Electric Power (AEP) does not endorse a mandatory regime or the two-step approach that is contemplated by the White Paper, with the U.S. acting first followed by other nations. AEP does not support mandatory greenhouse gas emission caps unless they are part of a binding international agreement that includes both developed and developing countries, such as China and India. While not endorsing these proposals in the White Paper, AEP believes it is important to fully engage and comment on these questions when requested by the Committee.

Obtaining binding agreements from all major emitting nations is an essential element of any effective global strategy to limit greenhouse gas emissions. The potential risks of climate change stem from CO_2 and other greenhouse gases emitted anywhere on earth. Therefore, any effective global strategy to limit the growth of greenhouse gases must include those nations who are significant contributors to total global emissions, including those in the developing world. It is widely recognized that China is rapidly becoming one of the largest emitters of CO_2, with India close behind. China's use of coal as a percentage of world consumption increased from about 20% in 1985 to over 29% in 2003. By 2025 China will consume almost 40% of the world's coal. The total CO2 emissions of China and India will exceed those of the United States in only three years (by 2009).

S. Res. 98 (Byrd-Hagel) has helped guide our national policy since it passed the Senate on July 25, 1997 by a vote of 95-0. AEP supports this resolution. In his floor statement at that time, and in subsequent floor statements, Senator Byrd stated that his resolution was intended to provide the framework for a binding international agreement that would include mandatory provisions for both the industrialized nations and those countries in the developing world who have the greatest amount of emissions and significantly contribute to the global problem. Following Senate approval and ratification of such an agreement by the United States, those mandatory provisions would then be included in implementing legislation to be considered and passed by the Congress. Senator Byrd also noted that S. Res. 98 would not apply to all developing nations, but only to those who are the largest sources of emissions, and that different types of mandatory provisions would be applied to the developing countries as compared to the industrialized nations commensurate with their levels of economic development. The important premise of S. Res. 98 is that nations like China and India will not take binding steps if they believe that the U.S. will act on its own without requiring comparable actions from those nations, resulting in the practical stipulation that nations like China and India must adopt binding commitments for their own economies simultaneously with the United States as part of a comprehensive international agreement.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

The principles articulated in the resolution establish an important point of reference in developing sensible national and global policy on the climate change issue. This approach is not only appropriate but also essential as the Committee considers a mandatory federal program for limiting greenhouse gas emissions. AEP does not endorse the approach of the White Paper, but in responding to the Committee's question, AEP believes that an effective international approach must be consistent with Byrd-Hagel and include provisions to encourage other nations to take appropriate action. Otherwise, any U.S. cap would be, at best, symbolic and environmentally flawed, while placing our economy at a competitive disadvantage.

Working within the framework outlined in the White Paper, AEP would propose that any mandatory program include straightforward provisions that make it clear the U.S. will not move forward beyond an initial first step, and will suspend that step, if those nations in the industrialized and developing world who are significant contributors to total global emissions do not join us in this effort. Previous legislative drafts proposed that a commission would determine if other nations have joined the U.S., either on a unilateral, bilateral or multilateral basis. If the commission determines that this has not happened, the Congress could pass a joint resolution to limit or stop additional reductions by the U.S. However, the effectiveness of this mechanism is questionable at best. In light of the many years or decades that it takes the Congress to pass major legislation, such a resolution would not be acted upon in a practical time frame. During that time, the U.S economy would be further disadvantaged by the inaction of other major emitters.

Any "two-step" process must therefore include an automatic trigger that would be invoked by the failure of the largest emitters to join U.S. efforts, and this must occur in the early years of the control program or at the end of the initial five-year phase. Such a trigger could be a provision that establishes intensity reduction targets for other nations based on percentages, and these would roughly correspond with the U.S. domestic targets, while taking into account differences between nations such as the greater growth required in a developing economy as it industrializes. The legislation should be structured to require an independent federal board or commission to make an objective factual determination as to whether the major emitters are meeting their intensity targets within a specified time period. A negative determination need not be triggered by a failure by one of the smaller of the significant contributing nations, which contribute only a small fraction of the total global greenhouse gas emissions, but would be invoked if one major nation, such as China or India, fails to act.

If the federal board or commission finds that a major emitting country has not achieved the intensity targets, automatic provisions would be triggered to alter or suspend further implementation of the federal greenhouse gas reduction program. Nations (like companies) will need time to fully implement a national program, and might be close to meeting their intensity goals. In the event that the targets for other nations have almost been met, the legislation could provide that the U.S. safety valve or target could continue but be modified in order to mitigate costs to the U.S. economy. However, the legislation would stipulate that a significant failure by other major emitting nations would result in a suspension of the U.S. program at the end of the initial phase (e.g., 5 years or less). This would be automatic, and provided for in the legislation, and would not require any additional action by Congress. However, the U.S. program would resume when these nations accept their responsibility to address climate change as members of the global community. The combination of suspension followed by a promised resumption of

the US program would provide a powerful incentive to influence the behavior of other large emitting nations, be they industrialized or developing.

This program would not be as effective as a comprehensive global treaty that would comply with the Byrd-Hagel resolution. The implementation and enforcement of a broad treaty would be preferable and more straightforward, as compared with the "two step" program that is contemplated by the White Paper. A comprehensive global treaty is, therefore, strongly preferred and is the approach that is recommended and supported by AEP.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Question 4a:

- What metrics are most valuable for comparison of developed and developing country mitigation efforts to U.S. efforts?

An intensity goal or cap as explained above.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Question 4b:

- What process should be used to evaluate the efforts of other nations and how frequently should such an evaluation take place?

The process is described above. The first evaluation of whether the targets in the legislation have been met by the major emitters would occur at the earliest point that is practicable (e.g., at the end of the initial phase or five years at the latest). Other countries would likely take three to five years after the enactment of a U.S. domestic program to follow our lead. Review of targets would occur in three or five-year intervals after the initial phase.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: Dennis Welch, American Electric Power

Clarifying Question 4c:

- Are there additional incentives that can be adopted to encourage developing country emission reductions?

Federal appropriations for foreign assistance programs have significantly declined over the last 30 years and are not likely to be restored. Significant U.S. government aid and assistance is not likely.

U.S. companies may choose to construct more expensive energy efficient plants and facilities in the developing world that would not otherwise be constructed, if the additional GHG reductions could be credited and utilized under a U.S. domestic program. This is easier to implement under a comprehensive multilateral treaty, however.

Chicago Climate Exchange

Submitter's Name/Affiliation: **Chicago Climate Exchange**
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Chicago Climate Exchange ("CCX") appreciates the opportunity to provide input on: Question 1 (Point of Regulation); Question 2 (Allocation); Question 3 (International Linkage).

CCX is the world's first, and North America's only operating, active and legally binding greenhouse gas ("GHG") emission reduction and trading system. CCX is the only rules-based, independently audited market for U.S. reductions in all six GHGs, with price transparency, registry and clearing provided through a comprehensive mechanism. Total emissions under management since 2003 makes CCX the world's second largest live GHG market (second only to Germany). CCX's 140 members represent a cross-section of the US economy, including leading companies such as Ford, DuPont, IBM, Baxter, American Electric Power, Tampa Electric, Dow Corning; cities such as Portland, OR, Chicago, IL and Oakland, CA; and the State of New Mexico. CCX is the world's only GHG reduction market incorporating standardized emission offsets for forestry, agriculture and methane. CCX's CEO, Dr. Richard L. Sandor, formerly served as Vice-Chairman of the Chicago Board of Trade and directed the first auctions for USEPA SO_2 emission allowances in 1993. Our input reflects decades of unique, real-world, and workable experience in developing environmental and commodity markets, including our European Climate Exchange and Chicago Climate Futures Exchange subsidiaries.

Use Trading System Designs that Have Repeatedly Proven Successful

CCX experience demonstrates that a GHG cap-and-trade system that allows emitters to manage annual reduction commitments – a design used in other proven trading systems (US SO_2 and NOx, EU CO_2) – gives clear signals that lead to direct internal action and trading responsibility and attendant opportunities. This design:

- Maximizes the benefits of emissions trading, as proven in the SO_2 program, and allows carbon pricing and trading to stimulate financing of capital improvements.
- Maximizes entrepreneurial response and rewards environmental innovation.
- Can cover a major portion of emissions from all six types of greenhouse gases, can be integrated with upstream systems for other emissions, and allows opt-in by small sources.
- Can bring significant benefits to the agriculture and forestry sectors, assuming carefully screened and specified rules with attendant scientific validity and verification.

Use Simple and Broad Emission Reduction Schedules, Credit Early Action and Projects

CCX experience suggests a workable system should:

- Include the maximum diversity of sectors using simple, percentage reduction schedules.
- Employ very small allowance auctions to provide price information. Like the SO_2 auctions, returning auction proceeds *pro rata* to emitters reduces compliance burdens.
- Fully recognize standardized and verified early reductions, as this will maximize ongoing capital investment, avoid undermining prior investment, and boost market liquidity.
- Include project-based mitigation activities, such as methane capture, and carbon sequestration by farms, forests and ranchlands, which produce multiple global and local benefits, help finance sustainable agricultural practices, and have proven workable.

Effectiveness of the above is being demonstrated by CCX members today. The environmental and economic benefits being generated are of national and global significance.

Who is regulated and where?

Please submit your response HERE. (no page limit)

CCX experience since 2003 clearly demonstrates that a GHG cap-and-trade system that allows emitters to manage commitments – a design used in other proven trading systems (US SO_2 and NOx, EU CO_2) – gives clear signals that lead to direct internal action and trading responsibility and attendant opportunities.

A design that primarily relies on realization of commitments by industrial fuel users and emitters of non-CO2 GHGs:

- Maximizes the benefits of emissions trading, as proven in the SO_2 program, and allows carbon pricing and trading to stimulate financing of capital improvements.
- Maximizes entrepreneurial response.
- Can cover a major portion of emissions from all six types of greenhouse gases, can be integrated with upstream systems for other emissions, and allows opt-in by small sources.
- Can bring significant benefits to the agriculture and forestry sectors, assuming carefully screened and specified rules with attendant scientific validity and verification.

The successful experience of CCX represents a major proof of concept in support of the observations presented herein. CCX is the world's first, and North America's only operating, active and legally binding greenhouse gas ("GHG") emission reduction and trading system. CCX is the only rules-based, independently audited market for U.S. reductions in all six GHGs, with price transparency, registry and clearing provided through a comprehensive mechanism. Total emissions under management since 2003 makes CCX the world's second largest live GHG market (second only to Germany). CCX's 140 members represent a broad cross-section of the US economy, and include leading companies such as Ford, DuPont, IBM, Baxter, American Electric Power, Tampa Electric, Dow Corning; cities such as Chicago and Oakland; and the state of New Mexico. CCX is the world's only GHG reduction market that incorporates standardized emission offsets from the forestry and agricultural sectors.

The input presented herein reflects decades of experience, including the design and launch of the European Climate Exchange (ECX) is a wholly owned subsidiary and sister organization of CCX, which currently represents 75% of total exchange volume traded in the European Union Emissions Trading Scheme (ETS). ECX offers a pan-European platform for carbon emissions trading with standardized contracts and clearing guarantees. More than 50 leading businesses, including global companies such as ABN AMRO, Barclays, BP, Calyon, Fortis, ICAP, Morgan Stanley and Shell are ECX Members. See www.europeanclimateexchange.com

As indicated by the list of CCX members presented in the Table below, this approach has already been implemented for a major portion of the U.S. economy. Emitting entities in CCX have taken taken a commitment to reduce entity-wide emissions to 4% below the 1998 through 2001

baseline, by the end of 2006. Emissions are quantified using standardized methods, and are independently audited.

An additional mitigation option for CCX member is to purchase verified project-based emission offsets. These credits are pre-defined using conservative methods. While offsets represent a small share of total emission reductions achieved to date in CCX, they offer important opportunities to include reductions from multiple sectors, to engage more mitigation efforts, and to reward sustainable agriculture and forestry.

Chicago Climate Exchange Members

Members			
DuPont American Electric Power Rolls-Royce Ford Motor Company Dow Corning Bayer Corporation Interface, Inc. Ozinga Bros Central Vermont Public Service	IBM Waste Management, Inc. Premium Standard Farms Abitibi-Consolidated Aracruz Celulose S.A. International Paper Klabin S.A. MeadWestvaco Corp. Stora Enso North America	State of New Mexico City of Boulder City of Chicago City of Oakland City of Portland Baxter Healthcare Green Mountain Power Manitoba Hydro TECO Energy, Inc. Motorola, Inc.	Tufts University The University of Iowa University of Minnesota The University of Oklahoma Aspen Skiing Company Temple-Inland Inc. ST Microelectronics Roanoke Electric Steel Corp. Amtrak
Associate Members			
World Resources Institute Mithun, Inc. Confederation of British Industry Amerex Power Domani LLC Global Change Associates Natural Capitalism, Inc. Airtricity Orion Energy Systems Ltd Sieben Energy Associates	Rocky Mountain Institute Access Industries, Inc. MB Investments, LLC Open Finance LLC Intercontinental Exchange Foley & Lardner American Coal Ash Association American Council on Renewable Energy	Presidio World College The Professional Risk Managers' International Association Jesuit Community of Santa Clara University Carbonfund.org Pax World Thermal Energy International	Millennium Cell Polar Technology TerraPass Houston Advanced Research Center Midwest Energy Efficiency Alliance Vanasse Hangen Brustlin, Inc. Delta Institute
Participant Members			
Iowa Farm Bureau	Eagle Market Makers	Peregrine Financial	C. Richard Stark, Jr.

Resource Technology Corp.	FCT Europe Ltd.	Group	Jeffery B. Stern
Restoration Soil & Research, Ltd.	First New York Securities LLC.	Rand Financial Services, Inc.	Lee B. Stern
Sustainable Forestry Management	Goldenberg, Hehmeyer & Co.	Brian Rice	TradeLink LLC
AGS Specialists LLC	ICAP Energy LLC	Serrino Trading Company	Tradition Financial Services
Michael R. Anderson	Christopher J. Johnson	Shatkin Arbor, Inc.	TransMarket Group
Breakwater Trading	Kottke Associates	Swiss Re	Calyon Financial
Raymond S. Cahnman	The League Corporation	Douglas M. Monieson	Thomas H. Dittmer
Glenn M. Miller	Marquette Partners, LP	Natsource LLC	Swiss Re

CCX experience suggests a workable system should:

- Include the maximum diversity of sectors using simple, percentage reduction schedules.
- Employ very small allowance auctions to provide price information. Like the SO_2 auctions, returning auction proceeds *pro rata* to emitters reduces compliance burdens.
- Fully recognize standardized and verified early reductions, as this will maximize ongoing capital investment, avoid undermining prior investment, and boost market liquidity.
- Include project-based mitigation activities, such as methane capture, and carbon sequestration by farms, forests and ranchlands, which produce multiple global and local benefits, helps finance sustainable agricultural practices, and have proven workable.

Effectiveness of the above elements is being demonstrated by CCX members today. The environmental and economic benefits being generated are of national and global significance.

Clarifying Question 1a:

- Is the objective of building a fair, simple, and rational greenhouse gas program best served by an economy-wide approach, or by limiting the program to a few sectors of the economy?

CCX experience since 2003 clearly demonstrates that a GHG cap-and-trade system that allows emitters to manage commitments – a design used in other proven trading systems (US SO_2 and NOx, EU CO_2) – gives clear signals that lead to direct internal action and trading responsibility and attendant opportunities. This design:

- Maximizes the benefits of emissions trading, as proven in the SO_2 program, and allows carbon pricing and trading to stimulate financing of capital improvements.
- Maximizes entrepreneurial response.
- Can cover a major portion of emissions from all six types of greenhouse gases, can be integrated with upstream systems for other emissions, and allows opt-in by small sources.
- Can bring significant benefits to the agriculture and forestry sectors, assuming carefully screened and specified rules with attendant scientific validity and verification.

A highly effective system with coverage of most of the economy can represent a major step forward in managing US emissions. This can be achieved by building a core program involving major industrial users of fossil fuels and entities that emit non-CO2 greenhouse gases. This approach can employ a market that is fully integrated with additional mechanisms that set emissions management for other diffuse emission types at up- or mid-stream levels. However, heavy reliance on a system that introduces tax-like signals and relies on energy users to produce a significant response to price signals is not a recipe for success. Such tax-like signals often get lost in the noise of market prices, can be overwhelmed by the effects of growing incomes on consumption pattern , and constitute an entirely unproven approach. Other policies can complement and address mitigation for activities not directly included in a downstream or downstream plus hybrid market.

Clarifying Question 1b:

- What is the most effective place in the chain of activities to regulate greenhouse gas emissions, both from the perspective of administrative simplicity and program effectiveness?

Other successful emission reduction and trading programs have proven that emitters are highly effective in managing direct commitments to reduce their own emissions. Incentives and compliance requirements are clear, not lost in the noise of fuel or materials prices, which can fluctuate due to numerous factors.

The downstream approach can employ a market that is fully integrated with additional mechanisms that set emissions management for other diffuse emission types at up- or mid-stream levels.

Question 2. Allocation
Submitter's Name/Affiliation: Paula DiPerna, Chicago Climate Exchange

Should the costs of regulation be mitigated for any sector of the economy, through the allocation of allowances without cost? Or, should allowances be distributed by means of an auction? If allowances are allocated, what is the criteria for and method of such allocation?

CCX experience with a large-scale, multi-sector GHG market suggests a workable system should allocate emission allowances, with additional charges (that would compound the cost faced by those who must achieve compliance with emission limits) at a uniform, slowly declining based on past emissions. This approach is fair, easy for industry and the public to understand, and would allow the system to:

- Include the maximum diversity of sectors
- Avoid complex
- Avoid designating winners and losers

If any allowance auctions are employed, the primary purpose should be to provide price information and stimulate the market. Like the SO_2 auctions, returning auction proceeds *pro rata* to emitters reduces compliance burdens. Auctions that involve significant quantities of allowances would introduce a major redistribution of financial resources and raise the cost burden to be borne by those subject to compliance commitments.

A sound system should fully recognize standardized and verified early reductions, as this will maximize ongoing capital investment, avoid undermining prior investment, and boost market liquidity.

The system should also full include project-based mitigation activities, such as methane capture, and carbon sequestration by farms, forests and ranchlands, which produce multiple global and local benefits, helps finance sustainable agricultural practices, and have proven workable.

Question 2. Allocation
Submitter's Name/Affiliation: Paula DiPerna, Chicago Climate Exchange

Clarifying Questions 2a:

Technology R&D and Incentives

- What level of resources should be devoted to stimulating technology innovation and early deployment?
- What portion, if any, of the revenues from permits or the auction of allowances should be reserved for technology development? If some portion is reserved for this purpose, should that set-aside flow to the federal government with funds spent through the traditional appropriation process? Or should the funds be allocated directly to a non-profit research consortium, chartered by the federal government, which would then administer technology development and deployment projects? Or should there be some combination of these two options?
- What criteria should be used to determine how such funds are spent and which projects are chosen?
- What other mechanisms should be used to promote technology deployment? Options include tax credits, cost-sharing for demonstration projects, assistance to state energy programs, etc.

Any auctions of emission allowances should be very small allowance auctions and have as a central purpose revelation of provide price information. Like the SO_2 auctions, returning auction proceeds *pro rata* to emitters reduces compliance burdens. Anything other than very small auctions will have the effect of causing significant financial resources taken from emitters, thus compounding the cost impact on their customers and other stakeholders.

Question 2. Allocation
Submitter's Name/Affiliation: Paula DiPerna, Chicago Climate Exchange

Clarifying Questions 2b:

Adaptation Assistance

- What portion of the overall allowance pool should be dedicated to adaptation research or adaptation-related activities?
- How should these allowances or funds be administered?
- What is the appropriate division between federal vs. regional, state, and local initiatives?

Please begin your response HERE. (no page limit)

Clarifying Questions 2c:

Consumer Protections

- What portion of the overall allocation pool should be reserved to assist consumers?
- Should funds from the sale of permits or allowances be targeted primarily to low-income consumers, or should they be more widely distributed to benefit all consumers?

Please begin your response HERE. (no page limit)

Clarifying Questions 2d:

Set-Aside Programs

- What portion of the allocation pool should be reserved for the early reduction credit program and the offset pilot program?
- Are other set-aside programs needed?

A sound program would fully recognize standardized and verified early reductions, as this will maximize ongoing capital investment, avoid undermining prior investment, and boost market liquidity. Entities that have undertaken standardized and verified early reductions have done precisely what a multitude of policy signals have called for. In addition, the supply of allowances issued to early actors can provide an important source of liquidity to the emerging market.

Clarifying Questions 2e:

Special considerations for fossil-fuel producers?

- Would some upstream fossil fuel producers be unable to pass the cost of purchasing permits or allowances through in fuel prices if they are the regulated entity?
- Is there a sufficient policy rationale for addressing these costs to justify the complexity of setting up and administering an allocation system for these entities?
- What other options exist to address the inability of fossil fuel producers to pass through these costs?

Please begin your response HERE. (no page limit)

Question 2. Allocation
Submitter's Name/Affiliation: Paula DiPerna, Chicago Climate Exchange

Clarifying Questions 2f:

Allocations for downstream electric generators?

- Should electricity generators be included in the allocation if they are not regulated? (Clarification: We mean to ask if an electric generator should be included in the allocation if the greenhouse gas regulation occurs at a point of regulation that is upstream or downstream from the generator, but not the generator itself.)
- What portion of the total allocation should be granted to the electric power sector? Should it be based on the industry's share of greenhouse gas emissions or some other factor?
- Should generators in competitive and cost-of-service markets be treated differently under an allocation scheme?
- How should permits or allowances be distributed within the electric sector? Should it be based on historic emissions? Electricity output? Heat input?

The best and most workable system should include the maximum diversity of sectors. This is made possible by using simple, percentage reduction schedules relative to historic emissions. All entities would face the same proportionate goal, and those with lower emission rates would have a correspondingly lower reduction requirement.

Clarifying Questions 2g:

Allocations for energy-intensive industries?

- Is there a sufficient policy rationale to have an allocation to selected energy-intensive industries? What industries should be included in the allocation?
- What portion of the overall allocation framework should be reserved for these industries?
- What are the appropriate metrics for determining allocations across different industries?

The CCX program has demonstrated that efficiency actions of electricity end-users can be an important part of the solution in reducing economy-wide emissions. The ability to harness this powerful response can be readily reconciled to account for any possible double counting vis-à-vis electricity producers.

Clarifying Questions 2h:

Allocations to other industries/entities?

- What other industries/entities (e.g. agriculture, small businesses, etc.) should be considered in the allocation pool?
- What should be the basis for their share of the total allocation as well as for the distribution among such industries/entities?

Please begin your response HERE. (no page limit)

Question 3. International Linkage

Submitter's Name/Affiliation: Paula DiPerna, Chicago Climate Exchange, Inc.

Should a U.S. system be designed to eventually allow for trading with other greenhouse gas cap-and-trade systems being put in place around the world, such as the Canadian Large Final Emitter system or the European Union emissions trading system?

Chicago Climate Exchange applauds the recognition by the Senate that this is an important environmental and economic issue. The ability to trade with other greenhouse gas cap-and-trade systems should be an eventual goal of a U.S. system.

Due to emergence of the Chicago Climate Exchange and its European Climate Exchange subsidiary, international carbon market linkages involving U.S. entities are to a significant degree already in place. Expanding such linkages makes optimization of emission management on a global basis easier for international entities, which constitute a major portion of the U.S. economy. Given the global nature of the environmental issue, a greenhouse gas emission reduction system that allows international flexibility and encourages and credits reductions of emissions anywhere in the world would offer the long-term least-cost mechanism.

International linkages of the carbon market expand the breadth of efforts to reduce global emissions, expand and foster international business relations and help deepen positive social interaction. Importantly, carbon market linkages can expand the range of opportunity to realize financial benefit for U.S. entities that cut and offset greenhouse emissions.

Chicago Climate Exchange has already achieved several forms of international linkage through:

- A CCX subsidiary, European Climate Exchange ("ECX"), is by far the busiest central trading and clearing mechanism in the European Union Emissions Trading Scheme.
- Pursuant to CCX rules allowing inclusion of emission sources located in Canada and Mexico by corporates based in the U.S., several CCX Members have included emissions from facilities in those countries in their CCX commitment.
- CCX now includes Canadian entities (e.g. Manitoba Hydro, Abitibi Consolidated)
- CCX includes emissions of the following industrial entities in Brazil in accordance with CCX's standard baseline, auditing and emission reduction schedules:
    - Aracruz Cellulose
    - Klabin S.A.
- CCX includes emission offset projects from locations throughout the western hemisphere, with projects in additional locations now under consideration.
- CCX allows use of Certified Emission Reductions from the Clean Development Mechanism as acceptable in demonstrating compliance.
- Additional CCX international linkages are in development.

Question 3. International Linkage

Submitter's Name/Affiliation: Paula DiPerna, Chicago Climate Exchange, Inc.

In addition, many Chicago Climate Exchange members are international entities that currently operate in more than one greenhouse gas emission reduction and trading program.

The following entities are participants in both the CCX and EU markets:

DuPont
Baxter Healthcare International
Ford Motor Company
Bayer Chemical
Stora Enso
International Paper
Dow Corning
IBM
STMicroelectronics
Bayer Chemical

In addition, numerous trading firms, such as TradeLink and Calyon, are active traders in both the CCX and ECX carbon markets.

Other elements of existing carbon market linkages are:

- CCX Members and European entities use similar emission quantification and audit procedures
- CCX and ECX members use the electronic trading platform (see below)
- CCX and the European Market both allow use Certified Emission Reductions from the Clean Development Mechanism as acceptable in demonstrating compliance

Development of linkages is well under way, and should be an element of any legislative efforts that Congress may choose to adopt.

Question 3. International Linkage
Submitter's Name/Affiliation: Paula DiPerna, Chicago Climate Exchange, Inc.

Clarifying Question 3a:

- Do the potential benefits of leaving the door open to linkage outweigh the potential difficulties?

Yes. The benefits are significant, and the difficulties are not.

Question 3. International Linkage
Submitter's Name/Affiliation: Paula DiPerna, Chicago Climate Exchange, Inc.

Clarifying Question 3b:

- If linkage is desirable, what would be the process for deciding whether and how to link to systems in other countries?

(No answer provided.)

Question 3. International Linkage
Submitter's Name/Affiliation: Paula DiPerna, Chicago Climate Exchange, Inc.

Clarifying Question 3c:

- What sort of institutions or coordination would be required between linked systems?

Required conditions are mutual recognition agreements and linkages of emission allowance databases. Neither of these institutions need to be complex.

As a general matter, good practice for harmonizing programs would include similarity of measurement and reporting procedures and true-up schedules.

Climate Policy Center

Submitter's Name/Affiliation: LEE LANE
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Phone: 202-775-5191

CPC supports a domestic economy-wide, uniform, upstream cap-and-trade for greenhouse gases (GHGs). The policy must meet the tests posed by the Byrd-Hagel Resolution. It must not significantly harm the US economy. And it must ensure that key less developed countries (LDCs) take comparable action.

Climate-related R&D is the key to achieving both of these conditions. Existing technology cannot significantly reduce GHG emissions at a cost that most nations are willing to pay. The US will not sacrifice economic growth for GHG mitigation. Neither will China and India Hence, radically new, and far less costly, technology is a prerequisite for climate policy success.

Although limiting GHG emissions will not, in itself, produce nearly enough new technology, using emission allowances to fund climate-related R&D might help to do so. This money, however, would be wasted unless federal energy R&D is substantially reorganized and reformed. Therefore, enactment of the PACE Bill, particularly its ARPA-E provision, is an essential precondition for using allowances to augment R&D funding. Ultimately, PACE is as crucial to successful climate policy as cap-and-trade is.

Even with the eventual promise of new technologies, constructing a cost-effective cap-and-trade will be challenging. Next to enacting a carbon tax, the safety valve provision is the best available way to boost the cost-effectiveness of GHG controls.

Moreover, by limiting the program's costs, the safety valve would allow Congress to use most of the emission allowances for maximizing the program's cost-effectiveness. R&D and budget deficit reduction appear to be the most promising strategies. To realize this potential, though, Congress would have to resist the blandishments of the various interests that are seeking to convert cap-and-trade into a cascade of windfall profits.

Linking a US cap-and-trade to the EU ETS or to other Kyoto Protocol-based international emission allowance trading schemes conflicts with using a safety valve. With linkage (and without the safety valve) US allowance prices and economic costs would rise. The temptation to check rising prices with bogus Russian 'hot air' allowances would grow. The choice between the safety valve and Kyoto linkage is, then, the choice between paying the US government for extra allowances and paying the Russian government for them.

The safety valve can also encourage China and India to adopt GHG limits. In the NCEP plan, Congress would consider halting the escalation of the US safety valve price if China and India fail to adopt adequate climate policies. Unfortunately, this NCEP provision is very weak. In the (likely) case of non-cooperation by China and India, Congress may delay or vacillate. This provision should, instead, incorporate the fail safe principle. The escalation of the safety valve price should halt automatically unless the executive branch certifies that China and India have taken comparable actions.

Question 1. Point of Regulation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Who is regulated and where?

The need to make a greenhouse gas (GHG) cap-and-trade program cost-effective dictates that such a program be economy-wide, uniform, and up-stream. The huge costs associated with climate change mitigation make cost-effectiveness vastly more important than with any previous environmental problem. Global GHG abatement cost estimates run in the *trillions* of dollars. The US share will inevitably be very large.

The need for cost-effectiveness dictates program architecture. An economy-wide plan will be more cost-effective than is a sector specific one. To be cost-effective, a GHG control plan must not only be economy-wide. It must also be uniform across sectors. In order to keep administrative costs within reason, an economy-wide plan must employ an upstream point of regulation.

The need to keep incentives uniform across sectors is obvious. Whether a ton of CO_2 is emitted by automobiles or power plants it does the same harm. Paying $20 to abate a ton of carbon from the transportation sector while limiting power plant marginal abatement costs to $7 would be senseless. Yet applying different control measures to different economic sectors virtually guarantees that wasteful disparities in marginal abatement costs will arise.

Subjecting some sectors to command-and-control regulations compounds the problem. To begin with, such regulations are usually much less cost-effective than is cap-and-trade. Then too, with command-and-control regulation, identifying the marginal cost of abatement is often difficult making it difficult to even detect the efficiency sapping cross-sectoral differences in marginal abatement costs.

The climate policies of many European countries violate this principle. They have shackled their economies with labyrinthine sector-specific regulatory structures. In this country, too, some proposals for GHG cap-and-trade actually include duplicative regulatory proposals like Renewable Performance Standards or CAFE standards. Adding such proposals to cap-and-trade can only diminish the policy's over all cost-effectiveness.

Question 1. Point of Regulation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Clarifying Question 1a:

- Is the objective of building a fair, simple, and rational greenhouse gas program best served by an economy-wide approach, or by limiting the program to a few sectors of the economy?

The White Paper sets the goal of eventually reversing the growth of GHG emissions. It proposes to achieve this goal without significantly harming the US economy. Reconciling these two objectives will be very difficult. Perhaps it is impossible. What chance there may be hinges on (among other things) Congress' ability to devise an extraordinarily cost-effective regulatory structure.

The need for cost-effectiveness dictates that the cap-and-trade program be economy-wide. A sector specific program may involve paying $7 to abate a ton of CO_2 in one sector while allowing other sectors to emit free of charge. Such an arrangement necessarily throws away some opportunities for cheap emission reductions. The lost opportunities would degrade the program's cost-effectiveness. Either a sector specific program would achieve less GHG reduction than it otherwise could for the same cost. Or it would cost more than would be necessary to achieve the desired emission reductions.

Today, it is true, that most of the lowest cost opportunities for emission reductions are concentrated in electric power generation. Some take this fact as justifying sector specific programs. However, with time, technological progress may change the various economic sectors' relative abatement costs. And even today, some low cost abatement opportunities exist in all sectors. By inference, then, a sectoral approach is inherently inferior to a uniform economy-wide one. It may become even more inferior with the passage of time.

Question 1. Point of Regulation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Clarifying Question 1b:

- What is the most effective place in the chain of activities to regulate greenhouse gas emissions, both from the perspective of administrative simplicity and program effectiveness?

The Committee White Paper notes that an economy-wide program must be applied upstream. The household, commercial, agricultural, and transportation sectors all involve very numerous small sources. With so many entities to be controlled, an economy-wide downstream program would entail prohibitively high administration, enforcement, and compliance costs.

Thus, if the large and growing transportation sector emissions are to be covered, upstream regulation is essential. The white paper mentions the option of requiring refiners (and presumably importers of refined products) to submit allowances for the GHG content of the transportation fuel that they sell. This proposal is sound.

The White Paper also mentions the deeply flawed concept of requiring auto makers to hold and submit allowances. Under such a scheme, automakers would be liable for the estimated fuel consumption of the new vehicles that they sell. This plan, like CAFE standards, could not encourage drivers to change behavior to conserve fuel. (Indeed it creates a perverse incentive to increase vehicle miles of travel.) Price-induced behavioral changes can, in fact, significantly change fuel consumption and, therefore, GHG output. Focusing the regulation on vehicles rather than on fuel, would simply throw away all these possible low costs opportunities for reducing emissions.

Further, in comparison with raising fuel prices, penalizing new vehicle sales delays the impact of the policy change. The incentives take effect only as new vehicles replace old, and they actually encourage drivers to slow that process by holding older vehicles longer. This policy, then, would simultaneously delay the environmental benefits of GHG controls while increasing the economic harm to the automobile industry.

Another disadvantage of controlling automobile manufacturers rather than fuel would be that it ignores all the other transportation sources. Automobiles account for only about one half of transportation sector GHG emissions. Motor carriers, railroads, and airlines are also significant GHG sources. Would these emission sources be exempt? Or would the cap-and-trade plan also impose penalties on the equipment manufacturers in all the other transportation sector?

Question 2. Allocation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Should the costs of regulation be mitigated for any sector of the economy, through the allocation of allowances without cost? Or, should allowances be distributed by means of an auction? If allowances are allocated, what is the criteria for and method of such allocation?

In reality, the choice between allocation and auction may conceal more than it reveals. Government could auction allowances and distribute the revenues to various private sector interests. Or it could allocate allowances to public or quasi-public institutions to do R&D or assist adaptation or perform other public purposes. Hence, the more meaningful question is to what purpose should government apply the value stream that allowances represent.

Allowance allocation will heavily influence the cost-effectiveness of any US cap-and-trade program. Allowance allocation poses a broad choice between competing objectives. Congress could use the value of allowances to boost the cost-effectiveness of national climate policy. Alternatively, it could distribute valuable allowances to add to the political support for enacting the proposed legislation – or reduce opposition to it.

There are two important options for boosting cost-effectiveness. In each case, the potential for improving cost-effectiveness appears to be substantial. These options are:

1. If Congress can reform government R&D institutions, allowance revenue could enhance the prospects of developing new low cost GHG abatement technologies. Cap-and-trade cannot produce an adequate level of private sector R&D. Government-funded R&D is essential for developing radically new technologies. Currently, however, the Executive Branch's R&D efforts on climate are inefficiently organized. Putting more money into the existing structures is likely to be wasteful. If however, Congress enacted PACE and the DOE faithfully implemented the ARPA-E provision, the prospects for cost-effective research would rise significantly.

2. Depositing allowance auction receipts in the Treasury would reduce the macroeconomic costs of cap-and-trade. Without such a provision, GHG cap-and-trade would increase the federal fiscal deficit. Emission limits will slow economic growth, hence, diminishing federal revenue. Prices of goods and services that government buys government will increase. A CPI increase will drive up some entitlement expenditures. Less revenue and higher expenditures mean a higher deficit. To cover the larger deficit, the federal government is likely either to increase borrowing or to raise taxes. Either approach will exacerbate the cap-and-trade program's macroeconomic costs. Auctioning allowances and depositing the money in the Federal Treasury could eliminate the deficit increase. By doing so, it would decrease total costs.

Of these two options, the first, using allowances to support climate-related R&D, is somewhat complex. Technological progress is central to the entire venture of climate policy. Unless GHG cap-and-trade is extended to the so-called 'threshold economies' like China and India, it will have no noticeable impact on the pace of climate change. At least for several decades, China, India, and similar countries are very unlikely to pay to limit their countries GHG emissions. Driving down the costs of controls offers the best single hope of reducing the time before such

countries might pay for GHG limitations. Advancing the relevant technology is by far the best and most realistic way to drive down global abatement costs.

GHG cap-and-trade will not, in itself, stimulate the volume and kind of R&D needed for a long-term solution to the climate problem. No large emission-free energy sources lie just over the horizon. (Hoffert *et al* 981) Thus, successful innovation in this area will require R&D involving unusually high risks and long lead times. Because developing such technologies will entail breakthroughs in basic science, much of the most essential work will be ineligible for patent protection.

These are precisely the conditions likely to deter private sector firms from selecting R&D as an approach to problem solving**.** (Edmonds and Stokes 163) Attempts to use emission controls to force the private sector to accelerate R&D efforts will collide with this private sector's bias against the needed kinds of research. Quantitative studies confirm that imposition of controls alone will only modestly increase private sector R&D directed toward technological solutions to climate change. (Popp 15)

In any case, attempting to decree emission allowance prices or tax rates into the distant future encounters a dilemma. Given the private sector bias against long-run R&D, future GHG allowance prices or taxes that are low enough to be politically credible will be too low to stimulate the needed level of R&D. But investors will not believe that a future government would actually impose allowance prices high enough to justify expensive R&D. In neither case, then, will the R&D occur. (Montgomery and Smith 20)

Public sector subsidies to R&D represent the only escape from this dilemma. Nevertheless, public sector R&D presents challenges. Some public sector R&D programs have been spectacularly successful. In the US, the National Institutes of Health and the Defense Advanced Projects Research Agency are examples of long sustained institutional productivity. Many other public sector R&D models have been less successful. Many of these have fallen within the purview of DOE.

Before Congress decides to use GHG emission allowances to increase finding for climate-related technology development, it should ensure that the R&D effort is structured in a way that maximizes the prospects of success. The current organizational structure of the Executive Branch's Climate Change Technology Program (CCTP) is deeply flawed. The program strategic planning process is starved for resources. The program is organized into narrow technology-defined stovepipes. It exists in an environment in which risk taking and innovation are not encouraged. Just pouring more money into such an enterprise cannot produce transformative new energy sources.

Senators Domenici and Bingaman have proposed legislation, the PACE Bill, that, if successfully implemented, would solve many of these problems. Part of this legislation would create an ARPA-E. These concepts are highly constructive. Indeed, full success of this legislation is every bit as crucial to US climate policy as is implementation of cap-and-trade. The critically important point, however, is that institutional reform is a prerequisite of successfully using allowance as a funding source for climate-related R&D.

Question 2. Allocation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Although Congress may use some GHG allowances to enhance the cap-and-trade program's cost-effectiveness, it will, doubtless, also use some allowances to encourage various constituencies to support the legislation. In using allowances to build a consensus in favor of cap-and-trade legislation, Congress might wish to observe three principles. These are:

1. All up-dating allocation systems erode the program's cost-effectiveness. Any allocation of allowances that affects current production (or shut-down or start-up) decisions will degrade efficiency. Generation performance standards and similar schemes subsidize electivity production. Because electricity production is associated with GHG emissions, a cap-and-trade that uses a generation performance system is a program at war with itself. Economic analysis shows that such policy gimmicks cause substantial losses in cost-effectiveness. If it is politically necessary to give allowances to industry, do not do so with an up-dating system.

2. Every allowance used to win the support of an interest group or constituency is unavailable for the task of enhancing the cap-and-trade program's cost-effectiveness. This fact argues for using allowances parsimoniously. 'Compensating' winners is inherently wasteful. Imposing a GHG cap-and-trade will confer windfall profits on low emission or emission-free electric power generators, manufacturers of energy efficient products, and firms that have already undertaken emission reductions. Using allowance allocation to pile another layer of windfall profits on such firms diverts scarce resources away from more worthy and more urgent causes.

3. In the same spirit, note that the safety valve can ensure that no constituency or interest group is severely harmed. The lower the safety valve price, the less need there is for allocating allowances to the highly vulnerable coal-related constituencies. It is true, that initially mild GHG controls may eventually escalate to more economically harmful levels. But in exchange for this long-term risk, affected companies receive mid-term investment planning certainty. And the long-term risk could be significantly lessened by firmly linking the stringency of US controls to the level of effort exhibited by China, India, and other threshold economies – a concept discussed in another part of CPC's comments.

Question 2. Allocation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Clarifying Questions 2a:

Technology R&D and Incentives

- What level of resources should be devoted to stimulating technology innovation and early deployment?
- What portion, if any, of the revenues from permits or the auction of allowances should be reserved for technology development? If some portion is reserved for this purpose, should that set-aside flow to the federal government with funds spent through the traditional appropriation process? Or should the funds be allocated directly to a non-profit research consortium, chartered by the federal government, which would then administer technology development and deployment projects? Or should there be some combination of these two options?
- What criteria should be used to determine how such funds are spent and which projects are chosen?
- What other mechanisms should be used to promote technology deployment? Options include tax credits, cost-sharing for demonstration projects, assistance to state energy programs, etc.

What level of resources should be devoted to stimulating technology innovation and early deployment? Implementing even relatively benign cap-and-trade programs are likely to cost the world (and the US) trillions of dollars. Large technological breakthroughs could dramatically lower these costs. In theory, this consideration suggests a large investment. The late Richard Smalley proposed $10 billion annually, an admittedly arbitrary number.

Policy makers should apply two important caveats to such recommendations. First, without institutional reform, government-funded R&D would probably be a poor investment. Simply increasing the resource commitments to the existing CCTP would be imprudent. Second, the opportunity costs of specialized scientific and engineering resources are very high; therefore, as far as possible, additional resources devoted to climate-related R&D should be pulled from non-R&D uses.

In the past, a large share of the resources used in publicly funded R&D has been diverted from other R&D activities. (Cohen and Noll) This fact greatly diminishes the net gains from such projects. But R&D resources are specialized. And expanding the total supply takes time.

PACE speaks to both of these problems. As already noted, with ARPA-E, the PACE legislation would reform the organizational structure of energy related R&D. Equally important, PACE aims to expand the nation's total scientific and engineering base. This expansion, if implemented, would raise the prospects that new (rather than diverted resources) could be used to augment the effort devoted to climate-related R&D. By doing so, it could significantly raise the benefit / cost ratio of the new R&D.

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Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

The rationale for government subsidy to technology deployment, as distinct from development, is very weak. GHG cap-and-trade would provide a market incentive to encourage the deployment of available or almost available technologies. Deployment does not encounter the long lead times and severe inappropriability of knowledge that discourages private sector basic research and early development. This nation, moreover, is richly endowed with sophisticated venture capitalists and bold entrepreneurs. Government, in contrast, is poorly qualified to determine when technologies are ready to be commercialized.

In general, then, government should concentrate on pre-competitive R&D, which the private sector will not undertake. It should impose an appropriate cap-and-trade to create an incentive for deploying new technology. And it should allow venture capitalists and entrepreneurs to decide what technologies to deploy and when to do so. If additional incentives are required for deployment of new technologies, these should be applied across the board through tax and regulatory authorities not applied ad hoc to climate-related technologies.

What portion, if any, of the revenues from permits or the auction of allowances should be reserved for technology development? If R&D can be reformed and wasteful deployment projects excluded, R&D would probably be the highest and best use of the value represented by emission allowances. In that case, the best procedure would be to decide how much can beneficially be spent on R&D. Enough allowances to fund that level of R&D should be provided.

It would be a grave error, however, to underestimate the importance of the caveat about institutional reform. If ARPA-E could be successfully implemented, it could greatly alleviate the infirmities of the existing CCTP. For this to happen, three conditions would have to be met:

1. The Secretary of DOE would have to fully embrace the new agency and the importance of its mission.

2. Congress, particularly the Appropriations Committees, would need an enduring commitment to the Agency and need to protect its freedom and its unique character.

3. All concerned would have to accept the importance of climate change solutions as a key component of the Agency's mission.

Temporarily putting aside the other two conditions, historical analysis of DARPA suggests that ARPA-E could not succeed without the full and enthusiastic support of the Secretary of DOE. (Van Atta) Yet the Department's initial reluctance to embrace ARPA-E is palpable. A realistic appraisal must, therefore, question whether this promising innovation can work in the DOE environment.

As I understand the matter, the DOE is continuing to consider ARPA-E. The best outcome from this consideration would be for them to fully embrace the concept. If, however, a negative or a tepid *pro forma* endorsement emerges, creating the needed innovative R&D structure outside of DOE would be preferable to consigning it to a stepchild role within that Department. In this case, an independent governmental corporation may represent the best environment. A recent paper outlined a version of this concept. (Caldeira, Day, Fulkerson, Hoffert, and Lane) An expanded version of this model may be worthy of consideration.

Question 2. Allocation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

The response to the last question concerning federal subsidies for technology deployment apply strongly to a government chartered corporation. That such an entity would be somewhat insulated from the normal checks of the appropriations process would be desirable in the case of precompetitive R&D. It is an invitation to abuse, if the corporation were to be authorized to use government money to compete with legitimate entrepreneurs.

What criteria should be used to determine how such funds are spent and which projects are chosen? The criteria developed in the CCTP Draft Strategic Plan are adequate. It is particularly important that the agenda as a whole can produce eventual results large enough to significantly alleviate the problem of climate change. (This is, in fact, one of the CCTP criteria.)

The primary risk associated with climate-related technology policy is that its focus will be too short-run and too small scale. The two problems reinforce each other. A focus on short-run results necessarily leads to over-emphasizing incremental advances. Such an impatient approach creates the risk of skimping on the only investments that have large enough potential pay offs to offer significant solutions. At the same time it may lavish resources on technologies like low velocity wind power that are at or near to commercial competitiveness but which face limitations that will inescapably limit them to filling larger or small niche markets.

Question 2. Allocation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Clarifying Questions 2b:

Adaptation Assistance

- What portion of the overall allowance pool should be dedicated to adaptation research or adaptation-related activities?
- How should these allowances or funds be administered?
- What is the appropriate division between federal vs. regional, state, and local initiatives?

What portion of the overall allowance pool should be dedicated to adaptation research or adaptation-related activities? R&D on adaptations is important. Financially, investments in adaptation should compete with mitigation on a benefit-cost basis. Almost certainly a mixed strategy would emerge from such a competition. Cost minimization is likely to require both mitigation and adaptation.

Whatever the results of mitigation strategies, some climate change is inevitable. Adaptation can significantly reduce net damages from it. More recent economic analyses of climate change damages typically produce results that fall below those of earlier studies. And one important reason is that the more recent studies have better accounted for adaptation's ability to blunt the harm from climate change. (Joel B. Smith 31)

Adaptation's evident power to reduce costs suggests using R&D to boost that power.

> It [adaptation] means *inter alia* pushing ahead with both the basic science and applications of genetic engineering in many areas, especially agriculture, but also to provide potential substitutes for possible useful species that may be lost. That could be supplemented by a systematic program for collecting, cataloguing, and storing genetic material, mainly but not exclusively from plants, in the form of seed banks and DNA. (Cooper 43)

Taking the logic of adaptation one-step further suggests conducting R&D on geoengineering. Climate policy must cope with the possibility of low probability but high cost events. (Nordhaus & Boyer 98) Should the climate system manifest a large and harmful discontinuity, having a mechanism for 'scramming' the climate change process could prove invaluable. (A 'scram' is the rapid emergency shutdown of a nuclear reactor or other system.) Indeed, unless we are prepared to assign a zero probability to "nasty surprises" from climate change, there seems good reason to undertake such research. (Keith and Dowlatabadi 293)

As insurance against runaway climate change, research on geoengineering may be superior to attempting to reach consensus on rapid emission cuts. Because mitigation is so slow, it would have to be initiated many decades before science confirmed the danger of rapid climate change.

(Realistically, under these circumstances, global political consensus is impossible as the Kyoto experience is demonstrating).

Geoengineering, in contrast, could be implemented relatively rapidly. For one thing, reaching international agreement for geoengineering would be relatively easy. A geoengineering strategy would not require governments to negotiate to impose massive lifestyle changes on their populations. Instead, a geoengineering agreement would be about the sharing of monetary costs, a type of negotiation for which we have much experience. (Schelling 2005 592) Meantime, the costs would be confined to the R&D needed to prove-up the technology's feasibility.

If geoengineering technology had to be deployed, it may be inexpensive compared to draconian emission cuts. The U.S. National Academy of Science, after studying geoengineering, concluded, "Perhaps one of the surprises of this analysis is the relatively low cost at which some of the geoengineering options might be implemented." (NAS 460)

Of course, until R&D is done, geoengineering options remain speculative. The technologies may prove to be ineffectual or to entail intolerable side affects. Then too, geoengineering is somewhat 'politically incorrect'. For now, however, buying knowledge about cost, feasibility, and possible side effects is all that is required.

Question 2. Allocation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Clarifying Questions 2c:

Consumer Protections

- What portion of the overall allocation pool should be reserved to assist consumers?
- Should funds from the sale of permits or allowances be targeted primarily to low-income consumers, or should they be more widely distributed to benefit all consumers?

Should funds from the sale of permits or allowances be targeted primarily to low-income consumers, or should they be more widely distributed to benefit all consumers? CPC has used the term 'consumer grandfathering' to describe the idea of transferring the value of GHG allowances to the household sector. Initially, the idea of compensating consumers sounds appealing. Most of the costs of a GHG cap-and-trade program will ultimately fall on consumers. The large stock of value represented by emission allowances could, in principle, offset much of this loss.

Implementing this idea, however, would encounter several practical problems. First consumer grandfathering, like all other grandfathering, whoever its beneficiary, diverts allowances into what is not even a zero sum game. As a result, these allowances are unavailable for R&D or diminishing the macro-economic harm done by cap-and-trade. If the goal were to offset the losses imposed on the household sector, government could accomplish that goal better by simply auctioning the allowances and using the resulting revenue to reduce the Federal budget deficit.

Then too, consumer grandfathering is in practice a negative sum game. Consumers pay most of the costs of a GHG cap-and-trade. Then, with consumer grandfathering, government would give them some of their money back – minus the transaction costs. And the transaction costs of transferring money to each and every household in America are likely to be considerable.

These transaction costs give rise to another problem. No one wants to incur significant transaction costs in order to deliver a few dollars to every household in the US. So the per household payments must be substantial – or run the risk of looking ridiculous. But if every household must receive a relatively substantial sum, much of the value of the allowances is likely to be consumed in this manner. How serious this problem may be depends largely on the alternative uses of the allowances.

Finally, political considerations are likely to drive up transaction costs. One relatively cheap way of redistributing money would be through the retail utilities. CPC once discussed this idea with senators. Soon, though, they decided that the payments had to be calibrated to the size of the households, more people more money. There utilities were to be required to ensure that renters would not fall through the system's cracks. Then too, Cap-and-trade's costs to consumers probably differ quite substantially by region; so payments would not be nationally uniform. Ingenuity may remedy these problems. But each refinement entails administrative costs. The risk of corruption and unintended consequences rise apace.

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Under these circumstances, if Congress wishes to offset cap-and-trade's costs to the poor, the best course is to funnel some additional money from allowances into existing poverty alleviation programs. This effort will not achieve a perfect offset. Indeed, such an offset would attenuate the cap-and-trade's incentive affects. It can, however, statistically eliminate the GHG limits normally repressive impact.

Question 2. Allocation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Clarifying Questions 2d:

Set-Aside Programs

- What portion of the allocation pool should be reserved for the early reduction credit program and the offset pilot program?
- Are other set-aside programs needed?

What portion of the allocation pool should be reserved for the early reduction credit program and the offset pilot program? Set aside programs are classic instances of 'compensating' winners. Most companies that reduce GHG reductions acted because they believed that the reductions would be profitable or that the publicity value was worth the cost. The prospect of cap-and-trade is so speculative and so distant in time that the expectation of allowances are unlikely to weigh heavily in making such investments.

Moreover, if an investment actually reduces GHG emissions, implementing mandatory GHG controls will automatically reward it. The operating costs of an early actor will rise less than those of competitors, which did not take early action. The resulting competitive advantage will result in either higher margins on sales or increases in market share.

Thus, most early actors expected to make money from their actions or at least to reap a public relations reward. They will gain competitively, if GHG limits go into effect. If these rewards are not enough to justify the investment, perhaps it was a mistake.

Question 2. Allocation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Clarifying Questions 2e:

Special considerations for fossil-fuel producers?

- Would some upstream fossil fuel producers be unable to pass the cost of purchasing permits or allowances through in fuel prices if they are the regulated entity?
- Is there a sufficient policy rationale for addressing these costs to justify the complexity of setting up and administering an allocation system for these entities?
- What other options exist to address the inability of fossil fuel producers to pass through these costs?

Would some upstream fossil fuel producers be unable to pass the cost of purchasing permits or allowances through in fuel prices if they are the regulated entity? Regardless of the point of regulation, many upstream fuel producers will bear part of the costs of GHG limits. Given GHG controls' relatively large cost impact on coal companies, this sector will almost certainly incur a non-trivial share of the total social costs of GHG limits.

Coal company losses will occur even though coal prices rise to reflect the opportunity costs of emission allowances. Indeed, they will even occur if the point of regulation is placed downstream on power generators and large manufacturers. The incidence of the cost of the policy is independent of the point of regulation. Coal producers and transporters will be affected not only by the opportunity costs of buying allowances but also by the costs of reducing emissions that would otherwise result from burning coal.

Wherever the point of regulation, GHG controls will reduce the demand for coal and its price (net of allowances). The lower sales volume and lower profit margin occurs regardless of the point of regulation. The higher costs of using coal will diminish the earnings potential of owners, managers, and laborers involved in coal production, transportation, and related industries and services. To a lesser degree the same is true of petroleum.

It cannot be overemphasized that the incidence of these costs in the energy sector is an inherent feature of GHG emission limits. Changing the point of regulation will have no impact on these realities.

Is there a sufficient policy rationale for addressing these costs to justify the complexity of setting up and administering an allocation system for these entities? There is as much of a rational for compensating these fuel producers as there is for compensating any other interest that is harmed by the imposition of controls. Actually, there is probably more reason. Coal producers in particular are likely to suffer serious economic harm from cap-and-trade, not only initially but as the program evolves. In many instances their assets may be more specialized than those of electric power generators.

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Coal production represents a relatively important and geographically concentrated economic interest. Moderating or eliminating their opposition to the proposal would significantly improve the legislation's chances of enactment.

Administering an allocation system for fuel producers would not be especially expensive. They are relatively few in number. The problem resides in the great difficulty in determining who should be compensated how much. But the cost of economic analysis to reduce the uncertainty is small in comparison with the economic stakes.

The more fundamental problem is the one raised previously. Allowances could enhance the program's over all cost-effectiveness. Using them as mere political lubricant diminishes the stock available for this purpose.

Question 2. Allocation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Clarifying Questions 2f:

Allocations for downstream electric generators?

- Should electricity generators be included in the allocation if they are not regulated? (Clarification: We mean to ask if an electric generator should be included in the allocation if the greenhouse gas regulation occurs at a point of regulation that is upstream or downstream from the generator, but not the generator itself.)
- What portion of the total allocation should be granted to the electric power sector? Should it be based on the industry's share of greenhouse gas emissions or some other factor?
- Should generators in competitive and cost-of-service markets be treated differently under an allocation scheme?
- How should permits or allowances be distributed within the electric sector? Should it be based on historic emissions? Electricity output? Heat input?

Should electricity generators be included in the allocation if they are not regulated? Presumably, "regulated" here means covered by the cap-and-trade program, i.e. a fossil fuel burning power generator. There is no rational for allocating emission allowances to non-emitting power generators. These generators will reap windfall profits as a result of the cap-and-trade program. They have every reason to support the program without receiving allowances. Allocating allowances to these power generators would merely add a second round of windfall profits. It would consume resources that would then become unavailable either to raise the program's cost-effectiveness or to compensate interests that actually experience losses.

Some proposed cap-and-trade legislation has offered allowances to these generators through a generation performance standard. As already discussed, such a proposal would further sap the entire plan's cost-effectiveness.

What portion of the total allocation should be granted to the electric power sector? Allocating allowances to power generators is subject to the same considerations as is allocating allowances to fuel producers. Some power companies will incur economic losses as a result of GHG cap-and-trade. For political reasons or reasons of fairness Congress may wish to compensate these firms for their losses.

There is no obvious reason why power producers should, in the allocation of allowances, receive priority over other sectors. On the contrary, unlike coal producers, many power producers, especially those with large amounts of nuclear or natural gas fired capacity, will reap windfall profits. They certainly do not need compensation.

If the purpose of the allocation is to compensate economic losses, basing electric power's share on GHG emissions would be extremely over generous. Much of the cost of GHG controls will be shifted downstream to consumers. Part, as already discussed will be borne upstream by fuel producers and transporters. The assumption that the sector should receive an allocation in proportion to its emissions totally ignores these large cost shifts. It also ignores the fact that

owners of gas fired power plants, while paying some price for the requirement to buy allowances will still, for the most part, realize net benefits as a result of the imposition of controls.

Should generators in competitive and cost-of-service markets be treated differently under an allocation scheme? Economic regulation can block firms subject to it from passing on the opportunity costs of allowances. This economic distortion undermines an important element in the way that GHG cap-and-trade is supposed to work. It, therefore, weakens the incentives to reduce emissions.

Placing the point of regulation upstream of the regulated entities may be one way of eliminating the problem. In that case, for example, for a power generator, the opportunity cost of the allowances would be incorporated in the price of the coal it purchased. The utility would merely pass that price on to its customers as a normal fuel price adjustment. Another option would be for Congress to mandate that the regulatory commissions allow the inclusion of allowance opportunity costs as a cost of doing business.

Either circumventing the problems caused by economic regulation or eliminating them would be vastly preferable to trying to construct different allocation systems for the two regimes.

How should permits or allowances be distributed within the electric sector? The most important principle in allocating allowances to power generators is to avoid an updating system. All else is secondary.

If Congress desires to compensate electric power producers for their losses, the best measure is likely to be some variant of historical coal fired generation as a percentage of total generation.

Question 3. International Linkage
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Should a U.S. system be designed to eventually allow for trading with other greenhouse gas cap-and-trade systems being put in place around the world, such as the Canadian Large Final Emitter system or the European Union emissions trading system?

Linking the US system to the EU ETS or other Kyoto systems would entail many severe disadvantages and no advantages. The key feature of the Bingaman Bill is the safety valve. The safety valve ensures that the cap-and-trade system will not require the economy to incur wasteful abatement costs to achieve emission reductions too soon and at too high a price. It also avoids what would otherwise be high costs associated with allowance price volatility. (Hubbard and Stiglitz) Thus, the safety valve enhances the chances that the benefits of the GHG system may exceed its costs.

The safety valve, however, is incompatible with the EU ETS. And the EU having proclaimed and repeatedly reaffirmed the goal of limiting global mean temperature to an increase of 2 degrees C, is clearly not going to accept a safety valve. Thus, there is an inescapable choice between international emission trading and the safety valve.

Trading with Kyoto system countries also entails opening the US system to the bogus hot air allowances. The large Russian and Ukrainian stocks of specious hot air allowances could indeed hold down the costs of meeting Kyoto's unrealistically stringent emission targets. In the Kyoto system, hot air allowances performed this function at the expense of requiring large income transfers from American industry to Russia and Ukraine. These transfers promised no environmental benefit and would have compromised the legitimacy of the entire system.

The safety valve provides cost control without these disadvantages. It requires no transfer payments to foreign governments. It introduces no artificial allowances.

Who would suffer from giving up the safety valve to permit international trading of allowances? Certainly, American industry and the cause of national competitiveness would suffer. Integrating the US with the EU-ETS would drive domestic allowance prices to the excessive levels that made Kyoto so disadvantageous to the US in the first place. It would also 'import' to the US the allowance price volatility that has already been a characteristic of the EU ETS.

Who would benefit? Companies that expect to receive an overly generous grant of emission allowances would might gain from integration of the US system and the EU ETS. Such companies would increase their windfall profits by selling excess allowances at the much higher allowance prices that would prevail if integration occurred. Most importantly, perhaps allowance traders would profit. For such interests allowance price volatility and the high transaction costs of international allowance trading are both profit opportunities.

The question that Congress should ask is whether these opportunities for private rent seeking are worth the sacrifice of national competitiveness.

Question 4. Developing Country Participation

Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

If a key element of the proposed U.S. system is to "encourage comparable action by other nations that are major trading partners and key contributors to global emissions," should the design concepts in the NCEP plan (i.e., to take some action and then make further steps contingent on a review of what these other nations do) be part of a mandatory market-based program? If so, how?

This question is extremely important. Including emissions caused by land use changes, the LDCs' annual GHG emissions already exceed those of industrialized countries. (METI 27) LDC emissions are growing far more rapidly than are those of the OECD countries. Indeed, it is impossible to stabilize atmospheric greenhouse gas concentrations at acceptable levels without constraining LDC emissions. (Yang and Jacoby 1997, 4) And the greatest opportunities to reduce the growth in greenhouse gas emissions at relatively low cost are concentrated in countries like China and India.

The realism of expecting such participation is, however, questionable. China, India, and the other 'threshold economies' give a much higher priority economic development than they do to reducing greenhouse gas emissions. Moreover, for such countries, economic development may be the best protection from climate change. It diminishes their economic dependency on the vulnerable agricultural, forestry, and fisheries sectors. It provides wealth needed for large scale investments in adaptation. And it can be undertaken independently of the vagaries of vastly complicated international agreements.

Some have argued that the US, by adopting GHG controls, would set an example that would induce China and India to do likewise. In a negative sense, this claim contains an element of truth. As long as the US refuses to adopt controls, China and India will certainly not do so.

The reverse, however, is unlikely to follow. American adherence to Kyoto or unilateral adoption of domestic GHG controls would not create an incentive for China and India to implement GHG limits. US controls on GHG limits would create a competitive boost for China and India vis a vis the US. Implementing Chinese or Indian controls would cancel this competitive advantage. Moreover, for India and China, GHG limits would harm them competitively vis-à-vis other LDCs. US controls, therefore, would not eliminate the economic incentives for China, and India to continue to resist GHG limits.

The NCEP legislation proposes one way to create such an incentive. It links (albeit too weakly) the escalation of the US safety valve price to reciprocal climate policy measures by China and India. At a minimum, linkage could prevent a purposeless unilateral escalation of US control costs. Without cooperation from the threshold economies, safety valve price escalation would be doomed to futility. Its impact on climate change would be trivial. But economic harm would grow as the safety valve escalated.

Unfortunately, the NCEP provision is too weak. Currently, the provision calls for the safety valve to go on escalating unless Congress acts affirmatively to halt it. But future promises may be distracted or impeded by other business. Years of competitive harm could pass before relief was provided.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

A remedy is readily available. The safety valve needs a fail safe system. With such an arrangement, the escalation of the safety valve price would stop automatically unless the President affirmatively certified to the Congress that China and India and other threshold economies had responded to the US control policies. An adequate response would be the implementation of a comparable policy. Absent such certification, the safety valve price escalation would stop. It would not resume until the certification of an appropriate response by China and India. Certification reports would be due at five year intervals.

Strengthen the NCEP provision. the standing offer to increase US efforts if those efforts are reciprocated would help to dispel the impression that the US is the sole holdout against international emission limits.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Clarifying Question 4a:

- What metrics are most valuable for comparison of developed and developing country mitigation efforts to U.S. efforts?

Two standards measure national level of climate policy effort. One standard is the marginal cost of abatement. Marginal abatement cost will be visible as a carbon tax rate, an allowance safety valve price, or an auction price. The second metric is national expenditures on climate-related R&D.

In practice many difficulties would arise. Some abatement policies are likely to be sector specific. R&D expenditures may vary greatly in quality and effectiveness. It might be difficult to compare these two areas of effort.

Nevertheless, these two standards cover the two activities that are likely to determine climate policy success. Some version of them is likely to be a reasonable approximation of level of effort. Perhaps the best approach would be to rely on an expert assessment looking at both areas.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Clarifying Question 4c:

- Are there additional incentives that can be adopted to encourage developing country emission reductions?

The so-called threshold countries (China, India and others) are clearly hoping to be paid to mitigate their GHG emissions. Many European climate policy advocates are proposing that the second phase of the Kyoto process re-engage the US on terms that would require this country, for several decades, to shoulder the lion's share of the costs of paying for GHG abatement in China and India as well as paying for draconian domestic emission reductions.

Clearly, shifting abatement costs to the US would remove the major Chinese and Indian objection to abatement. Quite possibly, it is the only policy that could do so. At some point these countries' national priorities might shift in a way that would increase their receptivity to climate change mitigation. Yet such a change may lie decades in the future.

Theoretically, for the US, paying China and India to adopt abatement incentives has appeal. The marginal cost of abatement in China and India is far below that in the US. The US would receive more for its abatement dollar by concentrating its efforts there than it would receive by concentrating its efforts at home. Again, however, practical problems abound.

First, many institutional problems prohibit the Chinese and Indian governments from adopting efficient GHG limitation policies. Their economies contain huge non-market components where economic incentives would be ineffectual. These societies are not fully subject to the rule of law. Government political legitimacy may be insufficient to impose unpopular energy price increases. Receiving transfer payments from the US would presumably help these governments buy political support. But transfer payments may not translate into the rule of law. And governments plagued by corruption may not be able to deliver payments to the intended beneficiaries.

Second, should the US government initiate income transfers designed in part to bolster the political legitimacy and taxing power of the government of the Peoples' Republic of China? To be sure, such transfers would occur under the cloak of the benign cause of mitigating climate change. Still, as a policy this would raise larger concerns.

Third, William Nordhaus has recently pointed out that international cap-and-trade programs are especially vulnerable to chicanery. Both the seller of foreign GHG emission allowances and the buyer profit from a generous interpretation of the validity of the emission reductions on which the allowance is supposedly based. This incentive pattern raises a risk of abuse even where the rule of law is unchallenged and enforcement institutions are powerful and well funded. Nordhaus recommends the use of carbon taxes rather than cap-and-trade. He is probably right. But both the Chinese and the Indian governments already experience difficulty with levying and collecting taxes.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: LEE LANE – CLIMATE POLICY CENTER

Fourth, the proposed international income transfers do not solve the enforcement problem. They merely postpone it. Initially, threshold countries receive net subsidies rather than incurring net costs. Eventually, however, threshold country emission control costs would begin exceeding the transfer payments. At that point, nothing prevents the formerly threshold country from abrogating controls.

Two economists associated with CPC, Scott Barrett and Thomas Schelling, have written extensively about the problem of encouraging developing countries to participate in GHG control schemes. It is noteworthy that both have concluded that prospects are poor at least for a long time. If they are correct, a fail safe limit on cap-and-trade is essential.

Natsource

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Provide an executive summary of your response(s)

Natsource has chosen to answer specific clarifying questions relating to three of the four questions incorporated in the White Paper that was released in February. A brief summary of each answer follows.

Question 1: Point of Regulation
Natsource believes that the program that is ultimately developed to address greenhouse gas (GHG) emissions should cover as high a percentage of national emissions as is possible, and should cover personal transport. We believe that such an approach would provide the greatest environmental and economic benefits. This approach reflects the following considerations: (1) personal transport emissions are the quickest growing portion of national emissions, and not covering them will make it difficult to achieve climate policy objectives in the longer-term; (2) industrial and power sector emissions are declining in other nations and will continue to do so as these emissions are covered by existing programs and others under development; and (3) existing policies regulating transport emissions were developed to address other energy and environmental challenges and are not adequate to reduce GHG emissions. Our response also identifies several options as to how personal transport emissions could be covered in a GHG control program.

Question 2: Allocation
d. Set-Aside Programs
Natsource did not answer this answer as asked. We addressed issues related to the development of a domestic GHG offset program. We believe that the development of a domestic offset program could provide significant economic and environmental benefits. In our answer, we identify and discuss the issues that need to be considered in the design of such a program and propose a few options that would enable the program to meet its objectives.

Question 3: International Linkage
Natsource answered all of the clarifying questions relating to this question. In short, we believe there are significant benefits that could be achieved from the linking of trading systems. Ultimately, linkage is dependant upon the key design elements in each program. We identify the key design elements of the EU program and those contemplated by U.S. legislative proposals. We then describe the differences between the EU program and U.S. proposals and the concerns that will likely arise in any discussion on linking.

Question 4: Developing Country Participation
We have undertaken a significant amount of work for the National Commission on Energy Policy (NCEP) in their assessment of the efforts of both developed and developing and countries in addressing the climate issue. Natsource developed a range of metrics to assess the performance of eight developed countries and four developing countries in addressing climate change. The metric focused on: (1) environmental performance; (2) efforts in developing a market based framework to reduce compliance costs; and (3) technological efforts. Natsource scored these nations' efforts through a qualitative and quantitative approach.

Question 1. Point of Regulation
Richard Rosenzweig/ Natsource LLC

Who is regulated and where?

Please submit your response HERE. (no page limit)

Question 1. Point of Regulation
Richard Rosenzweig/ Natsource LLC

Clarifying Question 1a:

- Is the objective of building a fair, simple, and rational greenhouse gas program best served by an economy-wide approach, or by limiting the program to a few sectors of the economy?

The objective of building a fair, simple and rational greenhouse gas program is best served by incorporating as broad a percentage of national greenhouse gas (GHG) emissions as possible in a market-based program. In particular, incorporating personal transport emissions in a GHG control program provides greater economic and environmental benefits than excluding such emissions from a program and only covering stationary sources. Economic benefits result from coverage of diverse sources with different marginal costs of abatement. Environmental benefits result because trading programs provide additional incentives for covered sources to reduce emissions to levels lower than required.

Incorporating personal transport emissions in a GHG control program provides the greatest opportunity to address the climate issue in the longer-term. For the most part transport emissions have grown significantly since 1990 and represent the quickest growing component of developed countries' GHG emissions. This trend is forecasted to continue until 2010. Emissions from the manufacturing and power sectors have either begun to slow and/or decline since 1990. They will continue to do so because they are or will be covered by GHG control programs in countries that have already committed to reducing emissions. Achieving long-term climate-related objectives will become increasingly difficult unless transportation emissions begin to be addressed. This is also an area in which the U.S. can take a leadership role in demonstrating how a workable economy-wide program can be developed and implemented. It is also important that the U.S. not develop a policy that limits policy-makers' options in the future. Developing a program that covers a few sectors will limit policy options in the future if it is determined that greater benefits would be secured by an economy wide approach.

Natsource's answer to this question is based on a paper that it prepared for and presented at the Fifth Annual Workshop on Greenhouse Gas Emissions Trading held on September 27th and 28th, 2005 and sponsored by the International Energy Agency, the International Emissions Trading Association and Electric Power Research Institute. We note that some of the data and policy developments incorporated in and cited in the paper may be slightly dated.

I. Introduction

The objective of building a fair, simple and rational greenhouse gas (GHG) program is best served by an economy-wide approach that incorporates personal transport emissions. The short-term effectiveness and long-term efficiency of a domestic policy will be dependent on the percentage of emissions that are covered in an integrated program. Economic analysis undertaken by the Charles River Associates and EPRI illustrate the benefits of incorporating personal transport emissions in a GHG control program. Historically, U.S. environmental policies have regulated transportation emissions separately from those at power plants and stationary sources. This has been the case with international climate policy as well. To date, no

region or nation has adopted a climate change policy that covers industrial, power plant, and transport emissions in an integrated fashion. These sector-specific approaches would be an inefficient way to address climate change and would increase economy-wide compliance costs. This is because opportunities for trading between economic sectors that have different marginal costs of abatement are lost. Achieving broad coverage of national emissions in a GHG control program could be achieved in several ways. We will identify several different ways in which this could be accomplished. There are clear environmental and economic benefits to developing such an approach.

Transport Emissions Have Been and Continue to be Addressed Differently from other Sectors

Different policy instruments have been put in place over the past three decades to regulate emissions from power plants and automobiles. Since the Clean Air Act Amendments of 1990, cap-and-trade programs increasingly have been used to regulate air pollutants from the power sector and other large stationary sources. A combination of approaches including traditional regulatory policies such as the corporate average fuel economy (CAFÉ) program, tax incentives designed to pull more efficient vehicles into the market, research and development (R&D) into new technologies designed to reduce costs of lower emitting technologies and fuels, and alternative fuel requirements are being utilized to reduce emissions and achieve other objectives in the transportation sector. Proposed climate legislation in the U.S. and policies recently adopted in the European Union and under development in other key emitting countries such as Canada and Japan are continuing this pattern of using different policies to regulate different sectors.

Knowledge gained from recent experience with more flexible policy approaches, combined with the recognition that the climate issue poses a challenge that differs from other energy and environmental issues, suggests that sector-specific policies will not achieve the same environmental and economic results as a more integrated economy-wide program. A program that regulates each sector's emissions independently would not allow for the cost saving opportunities that a broad program would provide. In addition, traditional regulatory approaches such as CAFÉ do not provide incentives for the auto sector to achieve better environmental results than required. In contrast, more flexible approaches have achieved emission reductions in excess of those required by law.

A policy designed to achieve reductions from the power sector first; similar to the approach embodied in past legislative proposals, is likely to be costly for achieving the long-term goal of stabilizing concentrations of carbon dioxide (CO_2) in the atmosphere. In the longer-term, a strategy that covers a single –sector or only stationary sources will tend to commit the country to sector-specific approaches to address climate change. This makes it more difficult to expand and/or change the program at a later time. This policy path would severely constrain the ability of companies and citizens to react to the inevitable changes in technology and energy markets that would otherwise impact their choices for addressing climate change. A more efficient approach would seek to get the signals right and then allow emissions reductions to be made where they are most economic. In addition to making it more difficult to expand or change the program at a later time, the policy approach would also not achieve significant climate benefits because rapidly growing personal transport emissions would continue to increase.

II. Transport Emissions are Growing in the U.S. and Internationally

The transport sector is an important source of greenhouse gas (GHG) emissions. This is particularly true of CO_2 emissions resulting from the combustion of fuels used in transport. Transportation emissions are among the fastest-growing of all sources in the U.S. and many other industrialized countries. In 2003, transportation emissions accounted for:

- 32% of CO_2 emissions in the U.S. They increased 19% since 1990, and are forecast to be 42% above 1990 levels by 2010.
- 25% of CO_2 emissions in the EU-15. They increased 23% since 1990, and are forecast to be 34% above 1990 levels by 2010;
- 20% of CO_2 emissions in Japan. They increased 20% since 1990, and are forecast to be 17% above 1990 levels by 2010;
- 31% of CO_2 emissions in Canada. They increased 26% since 1990, and are forecast to be 33% above 1990 levels by 2010.[1]

In comparison, stationary sources regulated by existing and planned downstream emissions trading programs account for approximately 45% of total CO_2 emissions in the EU, and approximately 46% of total GHG emissions in Canada.[2] These stationary sources include industry, whose emissions have remained flat or decreased since 1990, and the electric power sector, whose emissions have increased significantly (27% in the U.S., 29% in the EU, 29% in Japan, and 40% in Canada). In contrast to transport sector emissions, which are expected to grow significantly under existing policies, industry emissions and energy sector emissions growth will be limited by downstream trading systems such as the EU Emissions Trading Scheme (EU ETS) and the large final emitter (LFE) trading system under development in Canada.

Transport emissions are comprised of emissions from ground transport (including locomotives, buses, heavy trucks, and personal transport – cars, light trucks and motorcycles), air transport, and marine transport. This analysis focuses primarily on policy options to address emissions from personal transport, which accounts for the largest share of transport emissions.[3] To differing extents, some of the options also address other transport sectors' emissions as well.

Increases in transport emissions can be attributed to growth in transport activity, which has been twice as great as the rate of efficiency improvements over the past 25 years.[4] Between 1970 and 1990, the number of motor vehicles on the road worldwide grew 4.5% per year while light duty

[1] Forecasts for the U.S. and Japan refer to transport CO_2 emissions, and forecasts for the EU-15 and Canada refer to transport GHG emissions. The forecast for the U.S., the EU-15 and Canada are based on existing measures, and the forecast for Japan is based on existing plus additional measures.
[2] Coverage of emissions for the Canadian large final emitter (LFE) trading program is expressed in terms of percentage of total GHG emissions because the program will cover all GHGs, not only CO_2. The EU Emissions Trading Scheme will address only CO_2 emissions from covered sources in 2005-07, and may be expanded to cover other GHGs in 2008-12.
[3] In 2003, road transport CO_2 emissions accounted for 61% of total CO_2 emissions in the U.S., 93% in the EU, 90% in Japan, and 75% in Canada.
[4] "IPCC Third Assessment Report, Climate Change 2001: Working Group III: Mitigation", http://www.grida.no.climate/ipcc_tar/wg3/106.htm

vehicle fuel economy improved by 2% per year or less.[5] Similarly, air travel and truck freight activity have grown faster than have improvements in the rate of energy intensity (energy use per passenger km). [6]

In the U.S., increases in transport sector emissions can be attributed to increasing vehicle miles traveled (VMT), particularly for light trucks, and fuel economy that has declined slightly as light trucks that are less fuel efficient have significantly increased their share of the U.S. passenger vehicle fleet. Vehicle miles traveled has been increasing by 3.0% per year since 1970, with the exception of years in which oil price spikes and ensuing recessions occurred (1973-1974, 1979-1980, and 1990-1991).[7] During this period, VMT for light-duty trucks has increased much more rapidly than for passenger cars. Corporate average fuel economy (CAFÉ) standards for passenger cars have remained at 27.5 miles per gallon (mpg) since 1990, while the combined CAFÉ standard for two-wheel-drive and four-wheel-drive light trucks remained at 20.7 mpg from 1996 to 2003, at which point it was increased to 22.2 mpg for model year 2007.[8] [9] Actual performance of the total U.S. passenger vehicle fleet, including light-duty trucks, reached a high of 26.2 mpg in 1987, and since then has decreased to 24.6 mpg in 2002.[10] This can be attributed to the rapidly increasing share of light-duty trucks in the U.S. passenger vehicle fleet, from 28.1% in 1987 to 48.9% in 2002.[11]

On August 23, 2005, the Bush administration proposed new CAFÉ standards for light-duty trucks. The standards would create six different size categories and standards for sport utility vehicles (SUVs) and light-duty trucks. This represents a departure from the current regulations, which set a single standard for all light-duty trucks. The new standards would increase starting in model year 2008, and would reach 21.3 mpg for the largest size category to 28.4 mpg for the smallest in model year 2011.[12] During model years 2008-10, manufacturers would be able to choose between meeting proposed "unreformed" standards (22.2 mpg in model year 2008 for light duty trucks, as defined in current regulations, rising to 23.1 mpg and 23.5 mpg in model years 2009 and 2010, respectively) or the new standards.[13]

Increasing transport emissions present a challenge for all nations'. This is true for countries that have committed to achieving reductions in national GHG emissions in the near-term under the terms of the Kyoto Protocol (KP), and countries such as the U.S. that may seek to develop

[5] "IPCC Third Assessment Report, Climate Change 2001: Working Group III: Mitigation", http://www.grida.no/climate/ipcc_tar/wg3/098.htm#341
[6] ibid
[7] National Research Council, 2002, "Effectiveness and Impact of Corporate Average Fuel Economy (CAFÉ) Standards," Committee on the Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards, Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences, Transportation Research Board, National Research Council, National Academy Press, Washington, DC.
[8] http://www.nhtsa.dot.gov/cars/rules/cafe/FuelEconUpdates/2002/index.htm
[9] U.S. Department of Transportation, Light Truck Fuel Economy Standard Rulemaking (Model Years 2008 -2011), notice of proposed rulemaking, August 23, 2005, http://www.nhtsa.gov/portal/site/nhtsa/menuitem.43ac99aefa80569eea57529cdba046a0/
[10] ibid
[11] ibid
[12] U.S. Department of Transportation, Light Truck Fuel Economy Standard Rulemaking (Model Years 2008 -2011), notice of proposed rulemaking, August 23, 2005, op. cit.
[13] ibid

policies to limit their emissions in the near-term and participate in an international effort to achieve stabilization of atmospheric concentrations of GHGs -- the overarching objective of the United Nations Framework Convention on Climate Change (UNFCCC) in the longer-term. Transport and energy sector emissions growth is outpacing emission reductions achieved by the industrial sector. If transport emissions are allowed to increase, other sectors could face a disproportionate share of the overall national emission reduction burden in order to ensure that emissions targets are achieved. Alternatively, governments in Europe, Japan and Canada would be obligated to purchase a greater amount of emission reductions in order to meet a binding national target. Either of these developments would have impacts on equity and programmatic costs to reduce emissions.

Industrial emissions are declining and are covered by downstream trading programs

For the industrial sector, an increase in the sector's emission reduction burden could be difficult to achieve due to competitiveness concerns, and in light of the significant emission reductions and efficiency gains that the sector has already achieved. For example, industrial emissions in 2003 have decreased by 1% since 1990 in the U.S., 9% in the EU, and 11% in Canada, and they have remained virtually flat in Japan (increase of 1%). At the same time, transport emissions have increased by 19% in the U.S., 23% in the EU, 20% in Japan, and 26% in Canada during the same period of time.

Energy sector emissions will be covered by downstream trading programs

Unlike the industrial sector, energy sector emissions have increased significantly since 1990, with the exception of Europe. For example, U.S. electric power emissions have increased by 33% from 1990, and energy sector emissions in Japan and Canada have increased by 12% and 41%, respectively. European energy sector emissions, by contrast, have decreased by 2%. Coverage of the European energy sector under the EU ETS will likely result in further reductions, and coverage of the Canadian energy sector under the Canadian Large Final Emitter (LFE) trading program will achieve reductions relative to business as usual forecasts. Thus, even though this sector's emissions are increasing they are either covered by existing programs or will be covered by others that are under development. Given the effort that will be required to reduce these emissions, the energy sector is not a promising candidate for achieving additional reductions in the near-term to compensate for transport sector emissions growth.

Achieving reductions from other sectors to compensate for rising transport emissions is not practicable

If significant reductions cannot be achieved by the industrial or energy sectors to compensate for transport sector growth, disproportionate emission reduction burdens would need to be imposed on the remaining sectors of the economy (residential, commercial, waste, and land use/sinks) in order to achieve domestic emission reduction targets. However, it would be difficult to obtain additional large scale reductions from these sectors both from a programmatic and political perspective in order to compensate for rapidly growing transport emissions. From a programmatic perspective, it is administratively difficult to regulate millions of end-users and sources in these sectors. They are currently regulated by such approaches as appliance efficiency

and product standards, and energy efficiency standards for new residential and commercial buildings. With respect to political feasibility, policies that would reduce emissions from these sectors also could increase energy costs or limit consumer choices, making such policies exceptionally difficult to implement.

All of these dynamics make it extremely difficult to achieve the volume of emission reductions from the energy, industrial, commercial and residential sectors necessary to achieve emission reduction targets that would compensate for increasing transport emissions.

III. Standards Programs as Currently Structured Have Shortcomings in Addressing Climate Change

In most cases, traditional regulatory, tax, research and development and deployment policies have been utilized in the transport sector in the U.S. and elsewhere to enhance energy security by reducing national oil import demand and to improve environmental performance. Such approaches have been and continue to be utilized to reduce transport sector emissions because policymakers have significant experience in developing them, understand how they work and what their impacts are. Familiarity with existing approaches is one reason why policy makers currently utilize a wide range of policy instruments to address GHG emissions in different sectors. For example, in jurisdictions considering emissions trading programs, policy-makers appear to prefer to regulate stationary source emissions through downstream trading programs because they have become familiar with such programs over the past decade. However, some of the approaches utilized to date in the transport sector, such as vehicle fuel economy standards, were not originally developed to address climate change. Instead, they were intended to address energy security issues and to address environmental problems different than climate with respect to the temporal and geographic nature of the problem. Despite this, maintaining or increasing the stringency of such standards programs generally constitutes the baseline approach for addressing GHG emissions from the personal transport sector. In addition to CO_2, which accounts for over 90% of the sector's GHG emissions, the sector also contributes to nitrous oxide (N_2O) and methane (CH_4) emissions.[14]

In the context of efforts to reduce GHG emissions, fuel efficiency programs have important shortcomings. Some of the limitations of efficiency standards follow:

- They do not provide incentives to reduce vehicle miles traveled (VMT) for new or existing vehicles, which is the primary contributor to increasing transport emissions.
- They are an economically inefficient way to reduce emissions because automakers have high marginal costs of abatement.
- As currently implemented, they do not provide an incentive to abate emissions beyond program requirements and thereby provide added environmental benefits, nor do they provide flexibility to achieve standards more cost-effectively.
- Environmental gains achieved through standards can be reduced somewhat due to the "rebound effect." This refers to a dynamic in which vehicle miles traveled (VMT)

[14] European Environment Agency, "Annual European Community greenhouse gas inventory 1990-2003 and inventory report 2005 – Submission to the UNFCCC Secretariat," May 2005, http://reports.eea.eu.int/technical_report_2005_4/en/tab_content_RLR

increases as a result of fuel cost savings created by vehicles that meet higher fuel economy standards.

- Environmental gains from fuel economy standards can also be reduced due to the "junker effect." This is a dynamic in which more stringent standards for new vehicles increases their cost, leading consumers to delay new vehicle purchases and continue driving older, less-efficient vehicles.

In contrast to the CAFE program, the emergence of national emission reduction targets has highlighted the advantages of market-based programs in achieving reductions across sectors in a coordinated, cost-effective manner, providing incentives to each sector to develop less emissions-intensive technologies, and ensuring that each sector contributes to meeting national targets cost effectively. Regulatory approaches used in the transport sector as they exist today will not be sufficient to achieve these multiple objectives, as discussed below. At the same time, market-based approaches are not without their own tradeoffs.

IV. GHG Trading Programs Have Excluded Transport Sector Emissions

Regions, countries and localities continue to develop climate change policies designed to reduce GHG emissions. Emissions trading programs have increased in popularity as a policy instrument utilized to achieve environmental objectives, including GHG emission reductions. The most prominent of these programs – the EU Emissions Trading Scheme (EU ETS) – is focused on reducing emissions from large point sources (i.e. large "downstream" sources). Canada's large final emitter (LFE) trading program to reduce GHG emissions, which is under development, is also a downstream program.

To date, the EU ETS and the proposed Canadian LFE trading program do not cover emissions from the transport sector. Other existing trading programs that were created to achieve reductions of conventional air pollutants to improve air quality and public health also focused on downstream sources. Policy-makers have attempted to reduce emissions from transport through other measures, including traditional regulatory programs, taxes, research and development (R&D), and deployment incentives.

EU ETS

The EU ETS is the largest GHG emission reduction program in the world. Starting in the spring of 2005, EU Member States have issued tradable EU allowances (EUAs) to installations regulated under the program. The program regulates 46% of the continent's CO_2 emissions (which represents approximately 30% of its total GHG emissions[15]) from approximately 12,000 installations in 25 countries. Sectors covered under the program include combustion plants, oil refineries, coke ovens, iron and steel plants, and factories making cement, glass, lime, brick, ceramics, pulp and paper. Reductions will be required in the 2005-2007 ("Phase 1") and 2008-2012 ("Phase 2") time periods. Significantly, the European Commission will be considering whether to expand the sectoral coverage of the EU ETS to include such additional sectors as the chemicals, aluminum and transport sectors, "with a view to further improving the economic

[15] "EU emissions trading: An open scheme providing global innovation to combat climate change," European Commission, 2004, http://europa.eu.int/comm/environment/climat/pdf/emission_trading2_en.pdf

efficiency of the scheme."[16] The Commission will prepare a report by June 30, 2006 addressing this issue. As part of this process, the Commission is currently considering the inclusion of the aviation sector in the EU ETS. It appears that aviation will be incorporated into the EU ETS at some point between 2008-2012. It is not envisioned that personal transport will be brought into the program in 2008.

Canada's Large Final Emitter trading program[17]

Canada is also in the process of developing a domestic emissions trading program (the "Large Final Emitter" program) which will operate in 2008-12, and which is expected to cover large downstream sources accounting for approximately 46% of national GHG emissions. The proposed LFE program was developed by a previous government and is currently undergoing revision. The transport sector will not be included in the trading program.

Japan

Japan has not yet decided whether it will develop a domestic trading program to meet its Kyoto target. However, despite the absence to date of mandatory GHG requirements for the Japanese private sector, Japanese firms became the most active participants in the global GHG market in 2003, and were second to the EU private sector in market share in 2004.[18]

U.S.

The U.S. has not adopted a domestic trading system at the federal level. However, in the northeast U.S., seven states have developed a regional cap and trade program (the Northeast Regional Greenhouse Gas Initiative (RGGI)) which will limit covered power plant emissions starting in 2009. The program does not cover transport emissions. Pursuant to a state law passed in 2002, California has issued draft regulations which would result in the "maximum feasible and cost effective" reductions of GHG emissions from cars and light trucks. GHG emissions from cars and light trucks would be regulated after model year 2009.[19] In 2009-12, the standards would result in a reduction of 22% relative to the 2002 year model fleet.[20] The standards can be

[16] EU Trading Directive (Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_275/l_27520031025en00320046.pdf)
[17] While the EU ETS and Canada's proposed LFE system are the most prominent GHG trading programs, the United Kingdom also developed a national trading program (the UK Emissions Trading Scheme (ETS)), which began in April 2002. The UK ETS, which is economy-wide, would allow project-based reductions from the transport sector to be created under the UK ETS. (See "Framework for the UK Emissions Trading Scheme, http://www.defra.gov.uk/environment/climatechange/trading/uk/pdf/trading-full.pdf.) We are not aware of any significant emission reductions generated from the UK transport sector through the UK ETS. In any case, the EU ETS will replace the UK ETS' requirements for large downstream sources in the UK starting in 2008.
[18] "State and Trends of the Carbon Market 2004," Franck Lecocq, Development Economics Research Group, World Bank, Karan Capoor, Carbon & Environmental Finance, Africa Region, Environment and Sustainable Development, World Bank, based on data and insights provided by Evolution Markets LLC and Natsource LLC, May 9, 2005.
[19] http://www.energy.ca.gov/global_climate_change/documents/ab_1493_bill_20020701_enrol.pdf
[20] California Environmental Protection Agency, Air Resources Board, "Fact sheet: Climate change emission control regulations, http://www.arb.ca.gov/cc/factsheets/cc_newfs.pdf

met through alternative compliance credits, which are emission reductions achieved through documented increased use of alternative fuels in vehicles regulated under the standard.[21]

V. Existing Policies Designed to Reduce Transport Sector Emissions Growth

Governments continue to utilize the types of programs that follow to address emissions from personal transport.

- Traditional regulatory programs such as those designed to increase fuel efficiency;
- Taxes to reduce fossil fuel demand;
- Research and development to push lower emitting vehicles and fuels into the market place; and
- Deployment incentives to pull such technologies and fuels into the market.

Many of these policies were initially developed as a response to oil price spikes in the early 1970s, and to enhance energy security and improve environmental performance in the transport sector. Such approaches have also been utilized to reduce transport sector GHG emissions because policymakers have significant experience in developing them, and understand how they work and their impacts. Familiarity with existing approaches such as downstream trading programs is one reason why policy-makers currently utilize a wide range of policy instruments to address GHG emissions in different sectors. However, until recently, such policies have not been developed to address climate change.

An overview of such policies in the U.S., the EU, Japan and Canada is provided in Appendix 2 to this document. These policies include but are not limited to the following:

U.S.

- Corporate average fuel economy (CAFÉ) standards (standards for cars have remained at 27.5 miles per gallon (mpg) since 1990; an increase in standards for different categories of light trucks was recently proposed);
- End-use taxes of approximately $0.10/liter of gasoline;
- An emphasis on R&D to develop hydrogen fuel cell technology, and
- Incentives for consumers to purchase lower-emitting technologies.

EU

- Agreement with automakers to achieve average CO_2 emissions of 140g/km (approximately 40 mpg) for all new passenger cars by 2008;
- End-use taxes of approximately $0.94/liter of gasoline;
- Directive to restructure taxes to ensure that at least 50% of revenue from registration and annual circulation taxes is based on CO_2 emissions by 2010;
- An emphasis on a "market pull" approach to stimulate technology deployment through emissions limitations designed to pull technologies into the market.

[21] California Environmental Protection Agency, Air Resources Board, Regulations to Control Greenhouse Gas Emissions from Motor Vehicles, Final Statement of Reasons, August 4, 2005, http://www.arb.ca.gov/regact/grnhsgas/fsor.pdf

Japan
- Top Runner fuel efficiency standards for 2010 set at 15 to 50 mpg.
- End-use taxes of approximately $0.55/liter of gasoline;
- R&D spending on energy-saving transport methods;
- Deployment targets and incentives for low-pollution vehicles**.**

Canada
- Company Average Fuel Consumption (CAFC) goal, which is equivalent to U.S. CAFÉ standards;
- Agreement with automakers to reduce GHG emissions from new vehicles by 6% from business as usual in 2010 through use of fuel-saving vehicle technologies;
- R&D spending on fuel cells and bio-fuels;
- Deployment incentives for lower emitting vehicles and fuels, and a target to blend ethanol into 25% of total gasoline volume, up from 7% today.

VI. Environmental and Efficiency Gains of Incorporating Transportation Sector in a Trading Program and Tradeoffs

At present, fuel efficiency standards are the principal policy tool for addressing GHG emissions from personal transport, despite the fact that they were initially designed to achieve other public policy objectives. As they are currently designed, fuel efficiency standards are limited in their ability to reduce GHG emissions from the transport sector. Some of these limitations can be overcome and additional benefits obtained through inclusion of the transport sector in an emissions trading program.[22] What follows is a brief description of the limitations of efficiency standards in reducing emissions from the sector.

Current design of fuel efficiency standards limit flexibility and do not achieve reduction goals

One shortcoming of the U.S.' CAFÉ program and comparable fuel efficiency programs in other countries is that they do not provide an incentive to abate emissions beyond program requirements and thereby provide added environmental benefits, nor do they provide flexibility to achieve standards cost-effectively. All automakers must meet the same standards, even if the marginal costs of achieving those standards differ significantly across manufacturers. The absence of incentives to over-control raises the long-term cost of achieving greater emission reductions by failing to incentivize investments in lower-emitting technologies. In contrast, trading programs provide incentives to over-control, which can help spur the development of lower-emitting technologies that will be needed to meet more ambitious emission reduction targets over time. Options for trading by automakers include allowing automakers to: (1) trade only among themselves to meet fuel efficiency requirements; or (2) sell credits (which they would receive for surpassing their fuel efficiency targets) to entities participating in a domestic

[22] A detailed examination of potential modifications to the CAFÉ program is provided in National Research Council, 2002, chapter 5, op. cit.

trading program; or (3) buy from or sell to such participants. Each of these options has different implications for achieving important policy objectives.

Fuel efficiency standards and VMT

Another limitation of fuel efficiency standards is that environmental gains can be reduced somewhat due to the "rebound effect." It is estimated that every 10% increase in fleet economy leads to a 1-2% increase in VMT, such that the net impact would be an 8-9% reduction in fuel use.[23]

Even more important, fuel economy standards do not address the trend of increasing VMT for all vehicles on the road, both new and existing. Increases in VMT for all vehicles (and for light trucks in particular in the U.S.) are driving road transport emissions increases. Fuel economy standards do not create incentives to reduce VMT – in fact, they result in a slight increase in VMT, as noted above. In order to reduce VMT overall, and to reduce VMT of the most CO_2-intensive vehicles, policies must offer drivers and transporters incentives to do so, and provide feasible alternatives to CO_2-intensive transport. These incentives could be provided by upstream trading programs that included CO_2 emissions embedded in fuel sold for transportation purposes, thereby increasing the cost of fuel.[24] Fuel taxes or carbon taxes could also achieve this objective. On the other hand, such policies may not be politically feasible. In addition, the price elasticity of motor fuel is estimated to be low, and fuel taxes in some jurisdictions, such as the UK, may already be higher than the optimal level from an economic efficiency standpoint.

Higher costs of new cars delays replacement of old cars ("junker effect")

Environmental gains from fuel economy standards can also be reduced due to the "junker effect." This is a dynamic in which more stringent standards for new vehicles increases their cost, leading consumers to delay new vehicle purchases and continue driving older, less-efficient vehicles.

Fuel efficiency standards are inefficient for achieving GHG emission reductions

A final, and key, limitation of fuel efficiency programs is that they are an economically inefficient way to obtain emission reductions. As noted above, automakers' marginal costs of CO_2 abatement are high. If automakers are allowed to participate in the market to comply with standards, this flexibility would significantly reduce their compliance costs. It would also increase the range of covered sources' marginal costs of abatement, thereby providing even greater cost-saving opportunities for the program overall, and reducing costs to the economy as a whole of achieving a given emission reduction target..

[23] Some of the shortcomings of fuel efficiency programs may not be resolved simply through their incorporation into a trading program. However, some potential remedies specific to CAFÉ programs could be envisioned, and are considered in National Research Council, 2002, op. cit.

[24] In an upstream trading program, fuel refiners, fuel importers, and/or other entities involved in fuel production, preparation, delivery and sales (i.e. "upstream" sources) are required to hold allowances for emissions associated with combustion of the fuels they sell.

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Challenges in incorporating transport emissions in a trading program

Incorporation of fuel efficiency programs into a trading program could be more efficient for the overall economy. The flexibility that trading programs would provide would allow emission reductions to be made through much more cost-effective means than compliance with fuel efficiency standards. This would reduce costs for automakers, and also would reduce the costs of achieving a given emissions reduction target for the economy as a whole. However, in considering different policy options to address transport emissions, it is important to consider potential tradeoffs with other objectives. For example, if automakers could purchase credits from a downstream trading program and use those credits to comply with fuel efficiency requirements, incentives to develop fuel efficient technology could be reduced, given the availability of a lower-cost compliance option. As a result, new fleets may not meet fuel efficiency standards. In addition, demand for GHG permits coming from automakers would push permit prices higher, thereby increasing compliance costs for other entities participating in a downstream trading system. While these challenges may be surmountable, they merit careful consideration.

Section VII provides a more detailed discussion of different options for incorporating transport emissions in trading programs, the advantages and disadvantages of these options, and the tradeoffs inherent in each of the options.

VII. Options to Incorporate Transport Sector Emissions into a Trading Program, and Other Economic-Instrument-Based Options to Address Transport Emissions

A. Overview

This section describes a number of options to address emissions from the personal transport sector. It starts with an overview of a legislative proposal by U.S. Senators McCain (Republican, Arizona) and Lieberman (Democrat, Connecticut) which would create an economy-wide trading program that covered transportation sector emissions. This proposal has been voted on twice by the Senate, and has received significant attention, particularly given its economy-wide approach. The discussion uses the proposal, which combines the features of an upstream and a downstream trading program, as a basis for introducing the concepts of upstream and downstream programs, and for reviewing some of the issues involved and options for incorporating the transport sector into a trading program.

In order to limit the scope of this discussion, we limit the number of options and variations evaluated in the analysis. Other options also warrant analysis. In view of this, several options not addressed in this analysis are briefly described and cited in reference notes.

1. McCain-Lieberman bill, and options to incorporate transport emissions in a trading system

No trading system has yet been implemented which incorporates transport sector emissions in a GHG trading program, other than through project-based emission reductions.[25] Proposed legislation in the U.S. introduced by Senators John McCain and Joseph Lieberman which is described in greater detail below, represents the first large-scale effort to design an economy-wide GHG trading program that incorporates transport emissions. In different iterations, the bill has been rejected by the U.S. Senate twice (55 to 43 in 2003, 60 to 38 in 2005[26]). Nevertheless, the bill or variations of it likely will be considered in the future.[27] The bill provides one example of a legislative vehicle that would create an economy-wide trading program that included transport emissions, and therefore serves as a useful starting point for discussions on this topic.

The following subsection begins with an overview of the McCain-Lieberman bill, which provides a basis for introducing the concepts of upstream trading programs, downstream trading programs, fuel efficiency programs and their current and potential interaction with trading programs.

B. McCain-Lieberman bill, and different approaches (upstream, downstream, and combinations) to incorporate transport sector emissions into a trading program

1. McCain-Lieberman bill - overview

On February 10, 2005, Senators McCain and Lieberman re-introduced the Climate Stewardship Act (S. 342). This bill is nearly identical to the version of the bill that was voted on by the Senate in October 2003. This legislation would cover approximately 85% of national emissions. As discussed below, the current version of the bill differs from the original, January 2003 version of the bill with regard to the ability of auto manufacturers to generate emission reduction credits and sell them into the trading program. Otherwise, for the purposes of this discussion, the key elements of the bill remain unchanged.

The McCain-Lieberman legislation would create a version of an "upstream/downstream" trading program -- a program combining features of an "upstream" trading program and a "downstream" program. The basic characteristics of each of these types of programs are discussed below, followed by a discussion of an integrated upstream/downstream program and the specific elements of the approach taken in the two versions of the McCain-Lieberman legislation.

2. Upstream trading programs

Upstream trading programs have the effect of increasing transport fuel prices, thereby creating incentives to reduce VMT, fuel use and associated emissions. Such programs could be implemented while existing fuel efficiency programs are maintained. Given that transport emissions are covered under such a program, it is also possible that fuel efficiency standards

[25] The UK ETS allows for the transport sector to generate project-based emission reductions that can be used for compliance by entities covered under the trading program.
[26] http://www.senate.gov/legislative/LIS/roll_call_lists/roll_call_vote_cfm.cfm?congress=109&session=1&vote=00148
[27] As discussed below, a bill introduced by Senator Bingaman (Democrat, New Mexico) in 2005 is similar in many respects to McCain-Lieberman bill. Given its less ambitious emission reduction targets, it may garner greater support.

could be eliminated if an upstream program were instituted. However, this would have other implications which are considered later.

In an upstream trading program, fuel refiners, fuel importers, and/or other entities involved in fuel production, preparation, delivery and sales (i.e. "upstream" sources) are required to hold allowances for emissions associated with combustion of the fuels they sell.[28] Under this approach, upstream sources would be expected to pass through their cost of compliance in the price of fuels, including those used in transport. Higher fuel prices would create incentives for all fuel users to reduce consumption or switch to less carbon-intensive fuels. Under an upstream approach, downstream emitters (i.e. direct emitters of GHGs) would not be required to hold allowances for their direct emissions. However, as noted above, higher fuel prices would provide incentives to downstream emitters to reduce their consumption or potentially to switch fuels to lower emitting ones. The impact on consumption and use of other fuels would be determined based upon the availability of alternatives and their costs. An upstream program could potentially cover nearly 100% of CO_2 emissions if it were applied to all fossil fuels that were consumed domestically. No upstream trading program (either for GHGs or for conventional air pollutants) has been implemented in any country to date.

A key design issue of upstream trading programs relates to which entities will be required to hold allowances. The Center for Clean Air Policy (CCAP) has considered the potential design of an upstream program that would cover transportation emissions. In CCAP's proposal for such a program, the allowance requirement would be imposed on approximately 1,250 U.S. upstream facilities - 175 refiners, 200 importers, and 875 gas processors and pipeline companies. This selection of upstream sources would exclude oil and gas wells and business entities engaged in the extraction or distribution of transportation-related fuels, which number in the hundreds of thousands, while regulating the smallest possible number of facilities."[29] This proposal took into account various tradeoffs relating to challenges in estimating imputed emissions from different upstream sources, and in administering the program. CCAP also highlighted accounting issues that would need to be addressed in designing an upstream program aimed at capturing transportation-related fuels. These include accounting for non-fuel use of fossil fuels such as for asphalt, which is not combusted, and avoiding double counting. [30]

3. Downstream trading programs

In a downstream trading program, downstream emitters of GHGs – typically large industrial and power sector emitters -- must hold allowances equal to their direct emissions. The majority of emissions trading programs that have been created to date or that are in development are downstream programs that cover stationary sources in the power, manufacturing and oil and gas sectors. Downstream GHG trading programs include the EU ETS, the proposed Canadian Large

[28] Although a detailed discussion on allocation approaches is outside of the scope of this analysis, it should be noted that such approaches for allocation include grandfathering, in which the covered source receives allowances for free equivalent to some portion of its emissions cap, and auctioning, in which all or a portion of allowances is auctioned to sources by the government. These allocation options can be applied in upstream or downstream programs. The majority of trading programs created to date utilize grandfathering.
[29] "Transportation and Domestic Greenhouse Gas Emissions Trading," S. Winkleman, T. Hargrave, C. Vanderlan, published by the Center for Clean Air Policy, April 2000, http://www.ccap.org/pdf/TGHG.pdf.
[30] ibid

Final Emitter (LFE) domestic trading program, and the UK Emissions Trading Scheme (ETS), each of which cover large sources.[31] The first large scale emissions trading program – the U.S. sulfur dioxide (SO_2) allowance trading program, which was designed to reduce precursors of acid deposition – is a downstream trading program limited to fossil-fired electricity generators. Most other emissions trading programs created to date -- including the U.S. Ozone Transport Commission's (OTC) Nitrogen Oxides (NO_x) Budget Program, the U.S. NO_x SIP Call, and regional and local NO_x trading programs (e.g. the RECLAIM program in Southern California, the Houston Galveston cap-and-trade program) -- are also downstream emissions trading programs.

4. McCain-Lieberman version of an upstream/downstream trading program [32]

As noted above, the McCain-Lieberman legislation would create an upstream/downstream program combining the elements of an upstream program and a downstream program. Under the legislation, downstream emissions sources that emit more than 10,000 metric tons CO_2e per year would be covered under the trading program.
Upstream entities that refine or import petroleum products for use in transportation would also be required to submit an allowance for each tonne of emissions associated with the combustion of their fuel for use in transportation. In addition, upstream entities that produce or import hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), or sulfur hexafluoride (SF_6) would be covered. All sources would face an emissions cap at 2000 levels by 2010. All covered sources would be issued allowances in an amount roughly equal to their emissions at the time the bill is enacted multiplied by a single discount factor for the entire program which would bring total allocations to year 2000 levels.[33] [34]

[31] The UK ETS is a special case in that it combines two types of participants in the trading program. CCA participants are companies that enter into a "Climate Change Agreement" (CCA) with the Government and take on emission reduction targets in exchange for an 80% discount in the Climate Change Levy – a tax on energy use by industry. CCA participants are typically large downstream emitters. However, one important group of downstream emitters -- electricity generators -- does not face the levy and therefore do not participate in the trading scheme. 6,000 companies have entered into CCAs and are therefore eligible to participate in trading. Other companies participating in the trading program are referred to as "Direct Participants." These companies bid in an auction for government incentive payments for taking on emission reductions commitments. There are 34 of these companies, which include some smaller downstream sources, such as local government authorities, as well as some large downstream sources. Http://www.defra.gov.uk/environment/climatechange/trading/uk/index.htm; and "Review of the First and Second Years of the UK Emissions Trading Scheme," prepared for UK Department for Environment, Food and Rural Affairs, http://www.defra.gov.uk/environment/climatechange/trading/uk/pdf/nera-commissionreport.pdf.

[32] In the literature, an upstream/downstream program is often referred to as a "hybrid" program because it combines the elements of two different approaches. However, the term "hybrid" is also used to characterize a downstream program that allows for trading with sources regulated under a tradable CAFÉ program. Given that many approaches could be described as hybrid approaches, we have opted not to use this term, and instead use more descriptive (if lengthy) titles to distinguish between different approaches.

[33] Each covered entity would receive an allocation equal to its emissions in the year prior to enactment of the legislation (e.g. 2004), reduced by allocation to early and accelerated participants, and multiplied by a discount factor equal to the total of all covered sectors' ghg emissions in 2004 divided by the total of all covered sectors' ghg emissions in 2004. The total allotment would therefore be equal to covered sector emissions in 2000. Each sector's allotment could be somewhat greater or lower than its emissions in 2004.

[34] As originally introduced in January 2003, the bill would have set a second emissions limit. Covered sources would have been required to reduce emissions to 1990 levels starting in 2016. The October 2003 version of the bill

Upstream coverage under the trading program would only include fuels used in the transport sector. Upstream coverage would not include petroleum products or natural gas that are combusted by large stationary sources, including electricity generators, since these sources' direct emissions would be covered under the program as downstream emissions. It also would not include petroleum products that are combusted in other non-transport sectors – i.e. the household and commercial sectors.[35] As a result, these sectors would not have incentives to reduce fuel use or shift to less carbon-intensive fuels, and would be shielded from fuel (e.g. home or office heating fuel) price increases. However, they would not be shielded from electricity price increases, as direct emissions from electricity generators would be covered under the program.[36]

The McCain-Lieberman bill is not the only example of a U.S. legislative proposal for an upstream/downstream GHG trading program. In June 2005, Senator Bingaman (Democrat, New Mexico) prepared a draft bill, the "Climate and Economy Insurance Act," which would allocate GHG allowances to upstream fuel distributors (i.e. importers of fossil fuels, petroleum refiners, coal mines, natural gas pipelines, natural gas processing plants) and downstream emitters of GHGs from industrial and chemical processes (i.e. and not from fossil fuel combustion).[37] The Bingaman bill was intended to be voted on as an amendment to the energy bill, and some believe it may have had sufficient votes to pass the Senate. However, a vote was not held. [38] The Bingaman bill differs in design from the McCain-Lieberman bill in that: 1) the former covers all upstream sources, and not only transport fuel suppliers; 2) downstream coverage is limited to process emissions, rather than all GHG emissions. In addition, like the October 2003 and January 2005 versions of the McCain-Lieberman bill, it does not specifically attempt to allow for interaction between automakers regulated under CAFÉ standards and the emissions trading system.

5. Upstream/downstream programs with and without tradable fuel efficiency standards

In its current form (S. 342, introduced on February 10, 2005), the McCain-Lieberman legislation would not interact with CAFÉ (i.e. fuel efficiency) regulations. It would create an upstream/downstream program in which transportation emissions would be addressed through: 1) increases in transportation fuel prices due to coverage of upstream sources under the trading program; and 2) maintenance of CAFÉ requirements for automakers. This approach could be classified as an "upstream/downstream program plus existing (non-tradable) CAFÉ" approach.

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and the current version of the bill (S. 342, introduced on February 10, 2005) eliminated that provision. They also eliminated provisions allowing auto manufacturers to generate credits and sell them into the trading program.

[35] These exclusions would require safeguards to protect against the potential reselling or diversion of fuel from excluded sectors to the transport sector, since fuel sold to excluded sectors would not be subject to allowance requirements, and would therefore be less expensive. See "Designing a Mandatory Greenhouse Gas Reduction Program for the U.S.," Robert Nordhaus, Kyle Danish, prepared for the Pew Center on Global Climate Change, 2003.

[36] Nordhaus and Danish, 2003, op. cit.

[37] The Climate and Economy Insurance Act of 2005, discussion draft from office of Senator Bingaman, June 16, 2005.

[38] http://www.pbs.org/newshour/bb/environment/jan-june05/emissions_6-22.html

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The original version of the McCain-Lieberman legislation introduced in January 2003 would have allowed auto manufacturers to participate in the trading program and sell "passenger vehicle fuel economy standard credits" to a registry if they exceeded their CAFÉ standards by more than 20%. The fuel economy standard credits could then subsequently be purchased by trading program participants. A conversion factor would have been determined for converting surplus fuel economy reductions into credits.[39] To avoid double-counting, the amount of allowances required from upstream sources would be reduced by the amount of credits sold to the registry during the preceding year. (This double-counting would arise if automobile manufacturers received credits for surpassing their targets, and if upstream sources, whose attributed emissions would be lower due to the improvement in fuel economy, did not receive an adjustment in their allowance allocations.)[40] Importantly, auto manufacturers would not have been able to purchase GHG permits from the trading program for the purpose of meeting their CAFÉ standards.

Downstream emitters regulated under the program would be able to use such credits interchangeably with GHG allowances for compliance. This approach would have created incentives for automakers to exceed their CAFÉ standards, where economical. It could be classified as an "upstream/downstream program plus tradable standards" approach in which vehicle manufacturers could only sell to trading program participants. Here, the term "standards" refers only to fuel economy standards. However, the concept of tradable standards potentially could also be applied to efficiency standards for energy-intensive equipment and appliances as well as fuel economy standards.[41]

Other possible variations on an "upstream/downstream plus tradable standards" approach include the following: 1) auto manufacturers could trade among product lines and with each other to meet CAFÉ requirements, but not with other sectors (this variation could also include a price cap for auto manufacturers); and 2) auto manufacturers could trade without restrictions among product lines, with each other, and with other sectors (i.e. they could buy permits from and sell to other sectors, rather than only sell to other sectors, as in the original McCain-Lieberman legislation as introduced in January 2003).[42] These variations have different implications and tradeoffs, and are considered in the next subsection.

[39] Under such an approach, the amount of credits issued for surplus fuel economy reductions would be based on the difference between the projected gasoline use of the life of the vehicle, using a legislatively deemed total lifetime vehicle miles, and the projected lifetime gasoline use of vehicles just meeting the target. National Research Council, 2002, op. cit.
[40] Nordhaus and Danish, 2003, op. cit.
[41] Nordhaus and Danish, 2003, op. cit.
[42] Nordhaus and Danish, 2003, op. cit.

C. Description of Options

a. Existing vehicle fuel efficiency standards plus (and independent of) a downstream trading system covering stationary sources [43] [44] [45] [46]

This represents the base case for the development of our paper for the IEA. It refers to existing fuel efficiency standards and voluntary targets, where they exist, combined with a downstream trading program which regulates key energy and manufacturing sectors that operate stationary sources, and which does not regulate transport emissions or provide for trading with automakers. Under this policy, automakers do not receive tradable credits for surpassing their targets, and could not buy credits from downstream trading sectors for compliance purposes.

b. Vehicle fuel efficiency standards that are tradable among manufacturers plus (and independent of) downstream trading system

This option, which was considered in a National Research Council analysis, differs from the base case in that manufacturers could receive credits for exceeding fuel efficiency standards. They could be sold to other manufacturers and used for compliance, thereby providing a degree of compliance flexibility. Credits under this option would be calculated based on the difference between total projected gasoline use over the life of
the vehicle at the achieved level of fuel efficiency, using a total lifetime VMT figure determined in legislation, and the total projected gasoline use associated with just meeting the target.[47]

[43] An examination of how existing fuel efficiency regulatory programs can be improved, other than by making them tradable or implementing a price cap, is outside of the scope of this analysis. A key limitation of passenger vehicle fuel efficiency programs not considered in this analysis is that they cover only a portion of all transport emissions. For example, fuel efficiency standards are not in place for many transport sectors in the U.S. (locomotives, vessels, aircraft, buses and heavy trucks), which accounted for nearly 50% of the GHG emissions in the transport sector in 2002 (Nordhaus and Danish, 2003, op. cit.). In addition, the National Research Council identifies a number of provisions in U.S. Corporate Average Fuel Economy (CAFÉ) standards that could be improved, including the following: 1) domestic and imported fleets must meet standards separately, raising costs; 2) the definition of a car under the standards (i.e. the exclusion of sport utility vehicles) is allowing for much higher emissions; 3) CAFÉ standards are encouraging manufacturers to decrease vehicle weight for cars in order to meet the standards, and increasing vehicle weight for other vehicles (e.g. SUVs) in order to avoid coverage under the standard, which leads to greater vehicle weight disparity and associated safety problems. National Research Council, 2002, op. cit. The NRC recommends changing CAFÉ standards such that the standards decrease with vehicle weight until they reach a certain cut-off, after which standards remain the same, regardless of weight.

[44] Combining existing U.S. CAFÉ requirements and product efficiency standards with a downstream trading system would cover 80% of GHG emissions; if expanded to cover commercial building equipment and transport other than non-light duty motor vehicles, could cover 95% of GHG emissions. Nordhaus and Danish, 2003, op. cit.

[45] The Center for Clean Air Policy (CCAP) recommends converting U.S. fuel efficiency standards into Corporate Average Carbon Efficiency (CACE). This would create incentives for auto manufacturers to produce vehicles that use low-carbon fuels as well as improve the efficiency of gasoline- and diesel-fueled vehicles. CCAP, op. cit. This variation on CAFÉ could be applied to any option involving fuel efficiency standards.

[46] While this analysis focuses on fuel efficiency standards, energy efficiency standards are also relevant in the context of designing domestic GHG reduction programs. Nordhaus and Danish consider policy options that include energy efficiency standards, and consider the specific double-counting issues that would need to be taken into account in policies that would allow for standards sectors to interact with trading sectors.

[47] National Research Council, 2002, op. cit.

c. Vehicle fuel efficiency standards in which manufacturers can only sell into the downstream trading system (original McCain-Lieberman bill, Jan. 2003 version)

This option differs from the previous options in that manufacturers are permitted to sell credits for exceeding fuel economy standards to entities that are covered under a downstream trading program, and that can use such credits for compliance. By limiting trading to sales from automakers to trading sectors, this option is similar to the approach proposed in the original January 2003 version of the McCain-Lieberman proposed legislation. That bill would allow automakers to sell credits to trading sectors if they exceeded their fuel efficiency standards by 20% or more. While it provides incentives to over-comply, it does not provide more compliance flexibility for auto manufacturers than the previous options.

d. Vehicle fuel efficiency standards that are fully tradable with downstream trading system

Similar to the original version of the McCain-Lieberman legislation, this option would allow automakers to sell credits for surpassing fuel efficiency standards into a downstream trading system. More importantly, in this option automakers would be allowed to purchase permits from the downstream trading system, and to use them to comply with their fuel efficiency standards. This option has been considered in the literature[48], and is the downstream plus efficiency standards option with the greatest flexibility and cost-effectiveness for automakers.

e. Upstream coverage of transport sector emissions (with or without fuel efficiency standards)

The first four options involve different versions of the base case scenario – a downstream trading system plus fuel efficiency standards – with different degrees of compliance flexibility and over-compliance incentives for automakers. This option considers a different type of trading system – an upstream system – both with and without fuel efficiency standards. As discussed above, in an upstream trading program, fuel refiners, fuel importers, and/or other entities involved in fuel production, preparation, delivery and sales are required to hold allowances for emissions associated with combustion of the fuels they sell.

f. Upstream coverage of transport emissions plus downstream trading plus vehicle fuel efficiency standards

In this option, a downstream trading system would be combined with upstream coverage of transport fuels. This is similar to the approach incorporated in the October 2003 and February 2005 versions of the McCain-Lieberman bill and an approach developed by Senator Bingaman. In addition, as in those versions of the bill, automakers would be able to sell credits to the downstream trading system if they exceeded their fuel efficiency target by 20%, but would not be able to buy credits from the downstream trading system to achieve compliance with fuel efficiency targets.

[48] See Nordhaus and Danish, 2003, op. cit.

Appendix 1: Transport Emissions in the Context of GHG Emission Reduction Objectives

Transport emissions have risen significantly since 1990 in industrialized countries. The following discussion considers emissions increases in the transport sector, and compares this performance to that of the industrial and energy sectors.

U.S.

In the U.S., CO_2 emissions from the transport sector accounted for 32% of total CO_2 emissions in 2003, compared with 29% for industry and 39% for the electric power sector.[49] (Within the transport sector, CO_2 emissions from motor gasoline accounted for 61% of total transport CO_2 emissions, and 20% of all U.S. CO_2 emissions.) U.S. transport CO_2 emissions increased by 19% between 1990 and 2003, compared with a 27% increase in electricity sector emissions and a 1% decrease in industry CO_2 emissions. Emissions from cars and light trucks increased by an estimated 25% during the 1990-2003 period.[50] Transport CO_2 emissions are forecast to increase an additional 19% from 2003 levels to 2010. This would mean that these emissions would increase 42% from 1990 levels.[51] End-use industrial CO_2 emissions, including indirect emissions from electricity consumed, are forecast to increase in 2010 by 10% from 1990 levels, while direct CO_2 emissions from the electric power sector are forecast to increase by 46%.[52]

Figures 1, 2 and 3 illustrate: a) the transport sector's share of total U.S. CO_2 emissions relative to other sectors in 2003; b) its growth since 1990; and c) emissions projections for 2010, respectively.

Figure 1: Sectoral contributions to U.S.' total carbon dioxide (CO_2) emissions in 2003

[49] Based on preliminary 2003 emissions estimates. Emissions from electricity end-use in industry are included in the estimate of industrial emissions. Emissions of Greenhouse Gases in the United States 2003, U.S. Energy Information Administration, http://www.eia.doe.gov/oiaf/1605/ggrpt/cdemissions_tbls.html

[50] "US transport emissions on the rise," Point Carbon, August 12, 2005, citing report by Environmental Defense, a U.S. non-governmental organization.

[51] U.S. Department of Energy, Energy Information Administration, Annual Energy Outlook 2005, Table A18, http://www.eia.doe.gov/oiaf/aeo/pdf/appa.pdf

[52] Projections provided by U.S. Department of Energy, Energy Information Administration, Emissions of Greenhouse Gases in the United States 2003, Report #: DOE/EIA-0573(2003, December 13, 2004, http://www.eia.doe.gov/oiaf/1605/ggrpt/carbon.html

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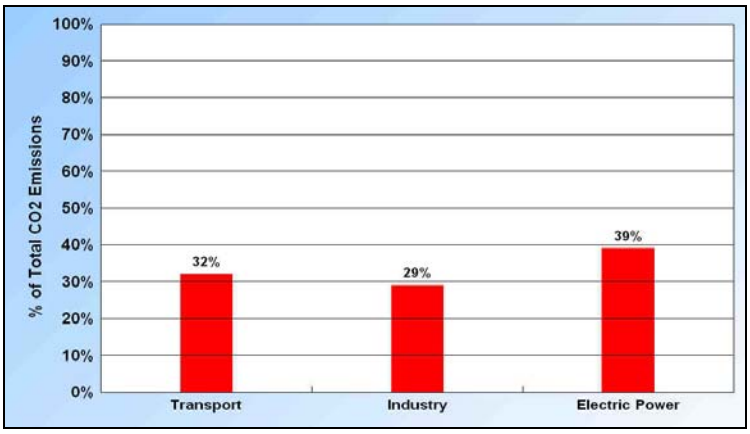
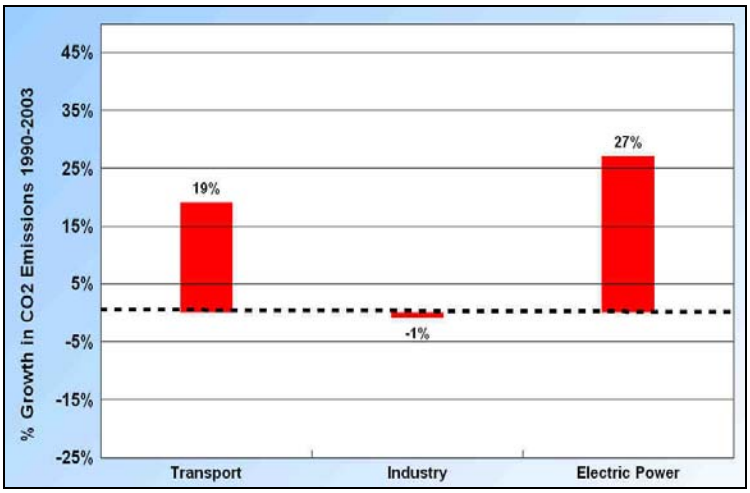


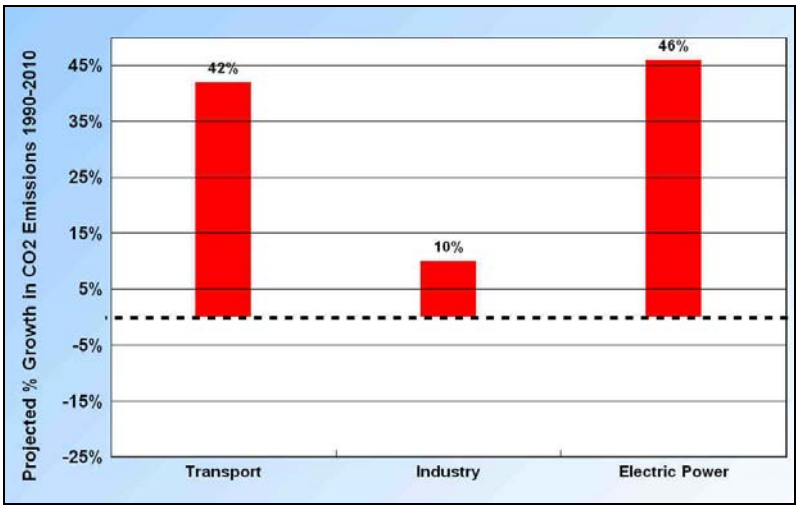
* Motor gasoline CO_2 emissions = 61% of total transport CO_2 emissions and 20% of national CO_2 emissions.

Figure 2: Growth in U.S. transport sector's carbon dioxide (CO_2) emissions, 1990-2003



* Emissions from cars and light trucks increased 25%.

Figure 3: Projected change in U.S. carbon dioxide (CO_2) emissions in 2010 by sector, relative to 1990



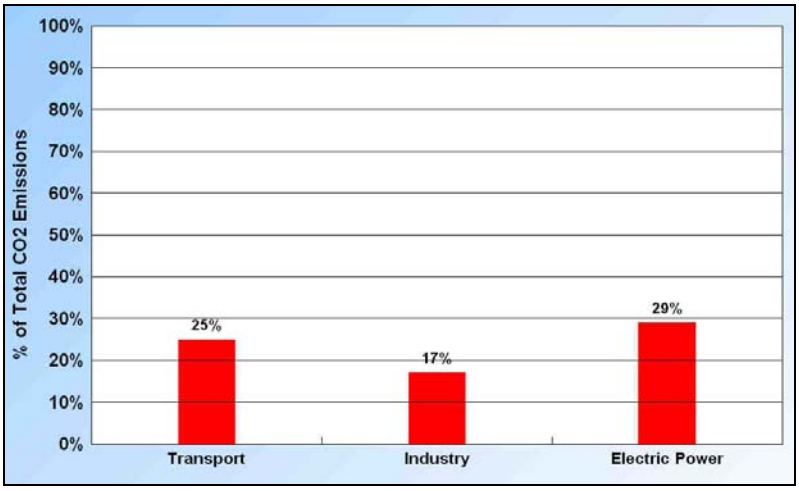
EU

In the EU-15, CO_2 emissions from the transport sector accounted for 25% of total CO_2 emissions in 2003, compared with 17% for manufacturing industries and construction and 29% for electricity and heat production.[53] (Road transport emissions accounted for 93% of all transport emissions.[54]) EU transport CO_2 emissions in 2003 were 23% above 1990 levels. In contrast, EU manufacturing industries and construction CO_2 emissions decreased 9% and electricity and industrial CO_2 emissions from fossil fuel combustion increased 6%. CO_2 emissions from industrial and electricity sectors will likely decline from current levels as more stringent targets are imposed in Phase 2 of the EU ETS beginning in 2008. Transport GHG emissions are projected to increase to 34% above 1990 levels in 2010, based on existing measures.[55] Industry and power generation emissions in 2010 will depend on EU allowance allocations to these sectors in Phase 2 of the EU ETS. It is likely that allocations will require a decrease in these emissions relative to current levels in order to ensure that national emissions limitations under the Kyoto Protocol and the EU burden sharing agreement will be met.

Figures 4 and 5 illustrate: a) the transport sector's share of total EU-15 CO_2 emissions relative to other sectors in 2003; and b) its growth since 1990, respectively.

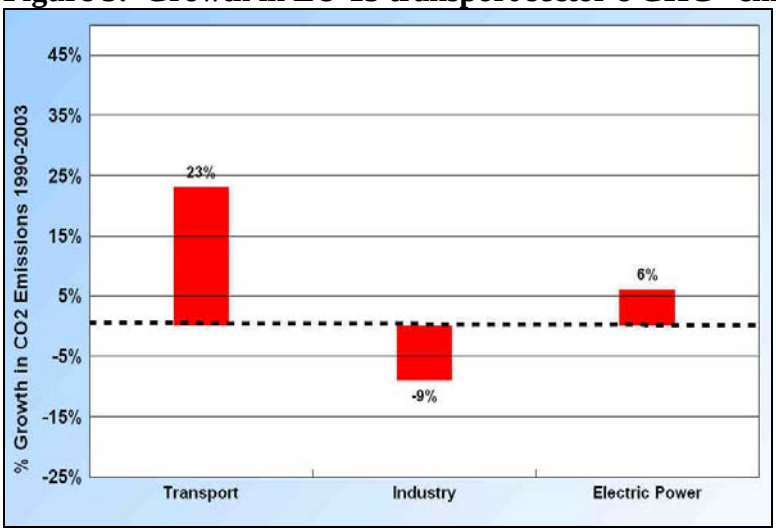
[53] European Environment Agency, "Annual European Community greenhouse gas inventory 1990-2003 and inventory report 2005 – Submission to the UNFCCC Secretariat," May 2005, http://reports.eea.eu.int/technical_report_2005_4/en/tab_content_RLR
[54] European Environment Agency, "Greenhouse gas emission trends and projections in Europe 2004," EEA report no. 5, 2004, http://reports.eea.eu.int/eea_report_2004_5/en/tab_content_RLR
[55] European Environment Agency, 2004, op. cit. Projection was not broken out into CO_2 and non-CO_2 GHGs.

Figure 4: Sectoral contributions to EU-15's total carbon dioxide (CO_2) emissions in 2003



* Road transport CO_2 emissions accounted for 93% of all transport CO_2 emissions. Industry includes manufacturing industries and construction. Electric power includes electricity and heat production.

Figure 5: Growth in EU-15 transport sector's GHG* emissions, 1990-2003



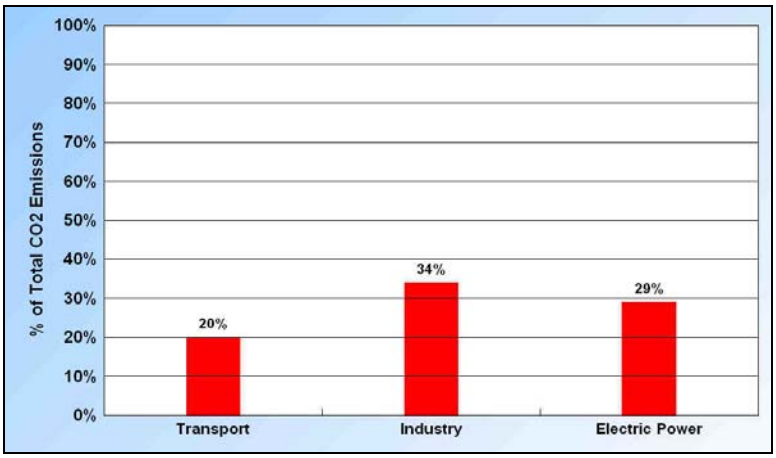
*** Projections are available only for GHG emissions rather than CO_2 emissions.**

Japan

Carbon dioxide emissions from Japan's transport sector in 2003 accounted for 20% of national CO_2 emissions. Industry (including process and fuel combustion emissions) accounted for 34% and power generation accounted for 29%.[56] (Road transport emissions accounted for 90% of all transport CO_2 emissions, and 18% of national CO_2 emissions.) Transport sector CO_2 emissions in 2003 were 20% higher than 1990 levels.[57] Over the same period, Japan's power generation emissions increased 16% and industrial emissions (including process and fuel combustion emissions) increased 1 % above 1990 levels.[58] Transport CO_2 emissions are estimated to be 17% above 1990 levels in 2010, based on additional measures to be implemented.[59] This would represent a reduction from 2003 transport emissions, which were 20% above 1990 levels, as noted above. With existing measures, CO_2 emissions from energy sources are projected to be 7% above 1990 levels in 2010.[60] Within this category, CO_2 emissions from industry (including indirect emissions from electricity consumption) are projected to be 7% below 1990 levels (based on voluntary agreements between industry and the Government).[61]

Figures 6, 7 and 8 illustrate: a) the transport sector's share of total Japan CO_2 emissions relative to other sectors in 2003; b) its growth since 1990; and c) emissions projections for 2010, respectively.

Figure 6: Sectoral contributions to Japan's total carbon dioxide emissions (CO_2) emissions in 2003



* Road transport CO_2 emissions accounted for 90% of all transport CO2 emissions, and 18% of national CO2 emissions. Industry includes process and fuel combustion emissions.

[56] http://www-gio.nies.go.jp/download/6gas_2005E-gioweb.xls
[57] ibid
[58] Greenhouse Gas Inventory Office of Japan, http://www-gio.nies.go.jp/download/6gas_2004E-gioweb.xls
[59] Japan Third National Communication Under the UNFCCC, Government of Japan, 2002, p. 135, http://unfccc.int/resource/docs/natc/japnc3.pdf
[60] ibid
[61] ibid

Figure 7: Growth in Japan's transport sector's carbon dioxide (CO_2) emissions, 1990-2003

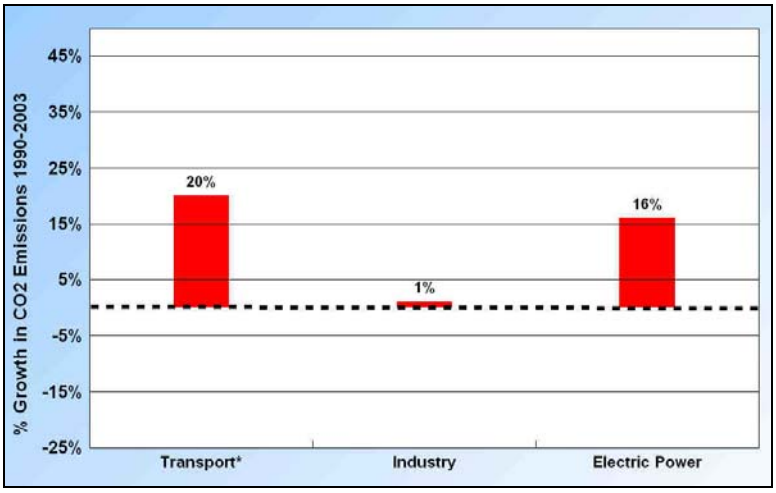
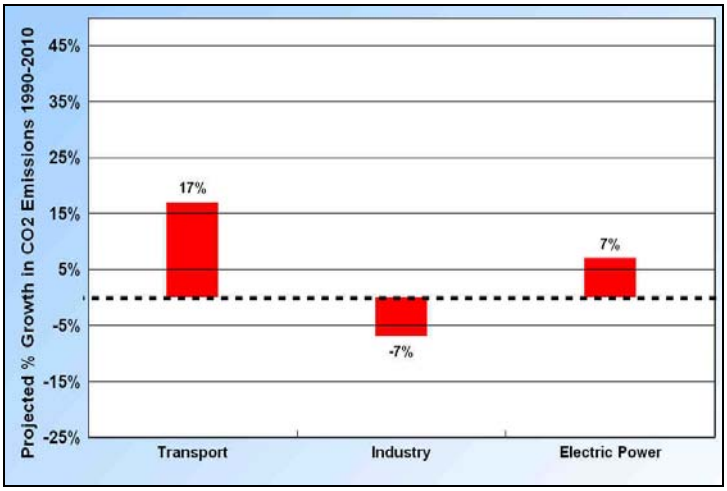


Figure 8: Projected change in Japan's carbon dioxide (CO_2) emissions in 2010 by sector, relative to 1990



* Transport forecast based on additional measures to be implemented. Industry and electric power forecasts are based on existing measures.

Canada

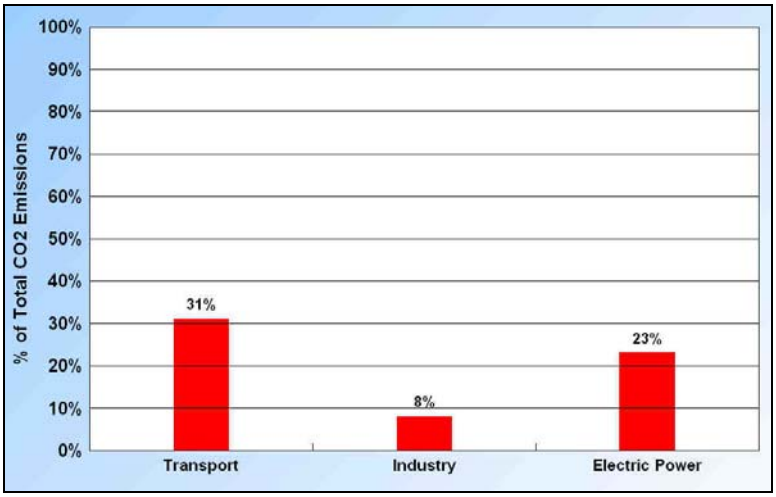
Carbon dioxide emissions from Canada's transport sector in 2003 accounted for 31% of national CO_2 emissions, while manufacturing industries accounted for 8%, the electricity and heat generation accounted for 23%, and fossil fuel industries (refining and production) accounted for 12%.[62] (Road transport emissions accounted for 75% of transport CO_2 emissions, and 23% of national CO_2 emissions.) Transport sector CO_2 emissions in 2003 were 26% higher than 1990 levels.[63] Over the same period, CO_2 emissions from Canada's manufacturing industries decreased 11%, electricity and heat generation emissions increased 40%, and fossil fuel

[62] http://www.ec.gc.ca/pdb/ghg/2005summary/2005summary_e.cfm
[63] ibid

industries emissions increased 38%.[64] Based on a year-2001 forecast, transport GHG emissions in Canada will be 33% above 1990 levels in 2010.[65] GHG emissions from electricity generation and industry are forecast to increase to 26% and 9% above 1990 levels in 2010, respectively.[66] Due to development of oil sands and exports of natural gas to the U.S., fossil fuel industries are projected to increase their GHG emissions by 64% above 1990 levels in 2010.[67]

Figures 9, 10 and 11 illustrate: a) the transport sector's share of total Canada CO_2 emissions relative to other sectors in 2003; b) its growth since 1990; and c) emissions projections for 2010, respectively.

Figure 9: Sectoral contributions to Canada's total carbon dioxide (CO_2) emissions in 2003



* Road transport CO_2 emissions accounted for 75% of transport CO_2 emissions, and 23% of national CO_2 emissions. Electric power includes electricity and heat generation.

[64] ibid
[65] Projection was not broken out into CO_2 and non-CO_2 GHGs. Canada's Third National Report on Climate Change, 2001, p. 86, http://unfccc.int/resource/docs/natc/cannce3.pdf.
[66] ibid
[67] Canada's Third National Report on Climate Change, 2001, op. cit., p. 85.

Figure 10: Growth in Canada's transport sector's (carbon dioxide) CO_2 emissions, 1990-2003

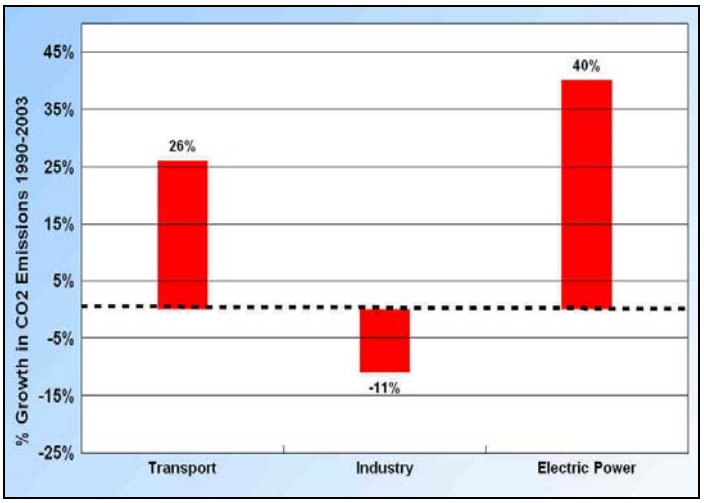
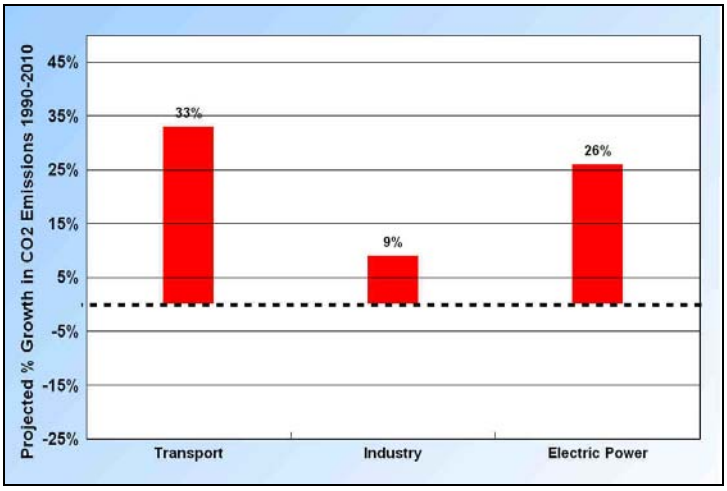


Figure 11: Projected change in Canada's GHG emissions in 2010 by sector, relative to 1990



* Projections are available only for GHG emissions rather than CO_2 emissions.

Increasing transport emissions present a challenge to countries that have committed to achieving reductions in national GHG emissions in the near-term under the terms of the Kyoto Protocol (KP), and to countries that may participate in an international effort to achieve stabilization of atmospheric concentrations of GHGs -- the overarching objective of the United Nations Framework Convention on Climate Change (UNFCCC). Transport emissions growth, along with energy sector emissions growth, is outpacing emission reductions in the industrial sector. If transport emissions continue to increase at current and forecasted levels, other sectors could face a disproportionate share of the overall national emission reduction burden in order to ensure that emissions targets are achieved. Alternatively, the government would be obligated to purchase a greater amount of emission reductions in order to meet a binding national target. (Governments are already major purchasers in international GHG markets, and may account for the majority of all GHG compliance purchases based on the gap between projected emissions and Kyoto

targets.[68] [69]) As discussed below, either one of these developments will have impacts on costs and equity in achieving GHG reductions.

[68] The World Bank's State of the Carbon Market 2005 report (to which Natsource contributed transaction data) indicated that governments accounted for one-third of the volume of GHG transactions in 2004. "State and Trends of the Carbon Market 2005," Franck Lecocq, Development Economics Research Group, World Bank, Karan Capoor, Carbon & Environmental Finance, Africa Region, Environment and Sustainable Development, World Bank, based on data and insights provided by Evolution Markets LLC and Natsource LLC, May 9, 2005.

[69] In a study prepared for IETA's, IEA's and EPRI's Third Annual Workshop on Greenhouse Gas Emissions Trading in 2003, Natsource estimated that buyer governments will account for approximately 45% to 73% of all direct, international compliance purchases. "Governments as Participants in International Markets for Greenhouse Gas Commodities," prepared by Natsource LLC for Electric Power Research Institute, The International Energy Agency, International Emissions Trading Association, and Institut du développement durable et des relations internationales, November 2003.

Appendix 2: Current Policies to Address GHG Emissions from Personal Transport

The following discussion provides a general overview of policies in the U.S., the EU, Japan and Canada to address emissions from personal transport. These include:

- Traditional regulatory programs such as those designed to increase fuel efficiency;
- Taxes to reduce fossil fuel demand;
- Research and development to push lower emitting vehicles and fuels into the market place; and
- Deployment incentives to pull such technologies and fuels into the market.

The overview is general in nature, and is not intended to provide a comprehensive review of national transport policies.

U.S.

In the U.S., several types of policies, including fuel economy standards, research and development to develop new technologies and incentives to stimulate deployment of lower emitting vehicles and fuels have been put in place to achieve several public policy objectives, including improvements in environmental performance and reducing dependence on oil imports.

Fuel efficiency regulations and policies

The objective of reducing dependence on oil imports continues to drive U.S. CAFÉ standards, as suggested by the following statement in the Bush administration's recent notice of proposed rulemaking on light truck standards:

> This rulemaking is mandated by the Energy Policy and Conservation Act (EPCA), which was enacted in the aftermath of the energy crisis created by the oil embargo of 1973-74. The concerns about energy security and the effects of energy prices and supply on national economic well-being that led to the enactment of EPCA remain alive today.

As noted above, U.S. fuel economy standards for passenger cars have remained at 27.5 mpg since 1990, and standards for light trucks remained at 20.7 mpg from 1996-2003, and were then raised to 22.2 mpg for model year 2007.

Taxes

As of August 2005, average end-use taxes on gasoline in the U.S. were approximately US$ 0.10/ liter. End-use taxes represent approximately 16% of the total price per liter of gasoline.[70] U.S. policies have relied less on taxes as a mechanism to influence consumer behavior than other countries.

[70] End-User Petroleum Product Prices and Average Crude Oil Import Costs, IEA, August 2005. http://library.iea.org/Textbase/stats/surveys/mps.pdf

Question 1. Point of Regulation
Richard Rosenzweig/ Natsource LLC

R&D

The U.S.' approach to development of new vehicle technologies has placed particular emphasis on funding for the early phases of the innovation cycle (i.e. a "market push" approach). The Government invests in R&D to develop transport emission reduction technologies that may have the potential to address the long-term nature of the climate issue. This approach differs from the EU technology policy to date, which has often placed greater emphasis on a "market pull" approach in which technology deployment is stimulated through emissions limitations and policies designed to pull technologies into the market.

The Clinton administration focused on new fuel efficiency technologies through its "clean car" initiative.[71] In contrast, the Bush administration is focusing on developing hydrogen fuel cell technology. President Bush announced in 2003 that he would seek $1.2 billion in research funding over five years to enable the U.S. to "lead the world in developing clean, hydrogen-powered automobiles."[72] In 2005, the US will spend approximately US $235 million on vehicle technologies.[73] [74]

Deployment Incentives

Tax incentives are available for consumers in the U.S. to purchase lower emitting vehicles.

EU

The EU has utilized fuel efficiency, tax and "market pull" policies to address GHG emissions from transport.

Fuel efficiency policies

In 1996, the European Union established a strategy to reduce CO_2 emissions from passenger vehicles through significant improvements in fuel efficiency. The strategy aims at achieving an average CO_2 emission figure for new passenger cars of 120 g CO_2/km by 2010 (approximately

[71] The Clinton administration initiated the Partnership for a New Generation of Vehicles program, which was aimed at developing technologies that could achieve fuel efficiency of up to 80 mpg. "Review of the Research Program of the Partnership for a New Generation of Vehicles, Fourth Report, Transportation Research Board, National Research Council, 1998, http://books.nap.edu/html/vehicle4/#summ.

[72] http://www1.voanews.com/article.cfm?objectID=B1524278-0DDD-4B24-9B320215C45A5913

[73] "FY 2004 Budget-in-Brief," U.S. Department of Energy, Energy Efficiency and Renewable Energy, http://tm.ask.com/r?t=an&s=d0&uid=241d71b8341d71b83&sid=1519B58D540426134&o=10358&qid=EAC46FA24AD4E10736E411851C0F70AA&io=1&sv=0a300532&ask=fiscal+year+2005+freedomcar+R%26D+funding&uip=41d71b83&en=te&eo=2&pt=EERE's%20Fiscal%20Year%202004%20Budget%20in%20Brief&ac=3&qs=1&pg=2&ep=1&te_par=226&te_id=&u=http%3A%2F%2Fwww.eere.energy.gov%2Foffice_eere%2Fpdfs%2Ffy04_budget_in_brief.pdf

[74] Ibid. This amount includes funding for: 1) the Hydrogen Fuel Initiative, a partnership with energy companies to advance hydrogen production, storage and infrastructure and to thereby accelerate the worldwide availability and affordability of hydrogen-powered fuel cell vehicles; 2) the FreedomCAR partnership with the auto industry, aimed at developing viable hydrogen fuel cell vehicle technology, and facilitating a decision by energy to commercialize hydrogen-powered fuel cell vehicles in 2015; and 3) research to improve the efficiency of advanced combustion engines using fuels incorporating non-petroleum based components.

48 mpg[75]). The strategy is based on three pillars: 1) commitments of the automobile industry to achieve an average of 140 g CO_2/km (approximately 40 mpg[76]) by 2008/2009 for new passenger vehicles; [77] 2) fuel-economy labeling of new cars to inform consumer decisions; and 3) use of fiscal measures to promote fuel efficiency of passenger vehicles.

In 1998, European Automobile Manufacturers' Association (ACEA) committed to: 1) achieve an indicative target of 165-170 g/km by 2003 (approximately 34-35 mpg[78]) as a basis for monitoring progress towards its 2008 goal; 2) by 2008, achieve average CO_2 emissions of 140g/km for all new passenger cars;[79] and 3) review potential to move towards average of 120g/km by 2012.[80] The EU has the same agreement with Japanese Automobile Manufacturers Association (JAMA) and Korean Automobile Manufacturers' Association (KAMA); however KAMA has until 2009 to achieve the 140g/km target and has an indicative target of 165-170 g/km in 2004. The EU Commission estimated that achievement of these targets for all new cars sold in the EU would reduce specific emissions from vehicles by 25% and contribute about 15% of the total emission reductions required from the EU under the KP.[81] However, based on a recent analysis, it appears that ACEA will achieve 80%, at best, of the gap between 1995 emissions intensity and the 2008 target (140 grams CO_2 per kilometer traveled). It is expected that JAMA, may only achieve 75% of target, and KAMA may end up achieving even less than the 75% target.[82] The targets are unlikely to be achieved unless Member States introduce economic incentives (e.g. taxes) that significantly influence consumer preferences towards more fuel efficient vehicles.[83] Underachievement of fuel efficiency targets could result in EU governments needing to increase their international purchases beyond planned levels.

Taxes

As of August 2005, average end-use taxes on gasoline in the EU were approximately US$ 0.94/ liter. End-use taxes represent approximately 62% of the total price per liter of gasoline.[84]

With regard to vehicle taxes, the Commission has proposed a new directive to modify existing vehicle taxes to place a greater emphasis on achieving environmental objectives and Kyoto

[75] General Motors 2004 Corporate Responsibility Report, Section 4 – Our Products, p. 34, http://www.gm.com/company/gmability/sustainability/reports/04/000_tools/4_ourprod.pdf
[76] ibid
[77] This would be equal to approximately 44.2 miles per gallon by 2008/2009 based on an analysis by the Pew Center for Global Climate Change, http://www.pewclimate.org/docUploads/Fuel%20Economy%20and%20GHG%20Standards%5F010605%5F110719%2Epdf
[78] General Motors 2004 Corporate Responsibility Report, Section 4 – Our Products, op. cit.
[79] ibid.
[80] http://www.acea.be/ACEA/brochure_co2.pdf
[81] "Reducing CO_2 Emissions from New Cars: A Progress Report on the Car Industry's Voluntary Agreement and an Assessment of the Need for Policy Instruments," Per Kageson, European Federation for Transport and Environment, 2005. http://www.t-e.nu/docs/Publications/2005pubs/05-1_te_co2_cars.pdf
[82] ibid.
[83] ibid.
[84] End-User Petroleum Product Prices and Average Crude Oil Import Costs, IEA, August 2005. http://library.iea.org/Textbase/stats/surveys/mps.pdf

Protocol obligations.[85] In July 2005, the European Commission approved a directive establishing rules for the calculation of taxes on passenger cars, on the basis of their CO_2 emissions. The directive would require each Member State to restructure vehicle taxes so that, by December 1, 2008, at least 25% of total tax revenue from registration taxes and annual circulation taxes on passenger vehicles is based on CO_2 emissions, and at least 50% by the end of 2010. The Commission has adopted the proposal for the new directive; however in order to become law, the EU 25 must vote to accept the proposal. A date for the vote from the EU 25 has not yet been determined. If the directive is accepted, it would be up to each Member State to determine the appropriate level of tax in terms of € per grams CO_2/km.[86]

R&D

With respect to R&D, as noted above, EU policy has often emphasized a "market pull" approach in which technology deployment is stimulated through emissions limitations and policies designed to pull technologies into the market. However, the European Commission recently recommended "a significant increase in EU spending for climate-friendly technology research and development, in particular in the energy and transport sectors."[87] Some Member States, including the UK and Germany, also fund R&D into low-carbon transport technologies.

Japan

Japan has utilized fuel efficiency policies, and is considering tax policies to reduce emissions from the transport sector. It also invests in R&D and has provided deployment incentives.

Fuel efficiency policies

The Government has set a target of improving automobile fuel efficiency by an average of 23 percent from 1995 levels by 2010. According to the JAMA, 70% of new cars sold in FY2002 met this standard, and nearly all new cars sold by 2005 will meet this standard.[88]

Japan began setting energy consumption efficiency standards for vehicles in 1979, after significant research was undertaken on energy savings measures in response to the oil crisis of 1973.[89] In 1999, in response to the ratification of the Kyoto Protocol, the Japanese Government established the "Top Runner" energy efficiency program to address a wide range of energy-intensive equipment and appliances, as well as passenger vehicles.[90] The program is designed to continually improve vehicle technology and reduce emissions. In 1998, the Government set the "Top Runner" standard for 2010 based on the most fuel efficient vehicle in each weight class

[85] Council directive on passenger car related taxes, http://europa.eu.int/comm/environment/co2/pdf/taxation_com_2005_261.pdf
[86] ibid.
[87] Commission of the European Communities, "Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: Willing the Battle Against Global Climate Change", Brussels, 2005.
[88] http://www.japantimes.co.jp/cgi-bin/getarticle.pl5?nn20040617f1.htm
[89] http://www.eccj.or.jp/top_runner/chapter1-2.html
[90] Top Runner Standard as a Countermeasure to Ongoing Residential and Commercial Sector and Transportation Sector Energy Consumption Increase, http://www.eccj.or.jp/top_runner/chapter1_2.html

available on the market.[91] [92] In 2010, all new vehicles must meet the standard. Any vehicles that achieve the standard for their category prior to 2010 will be given Top Runner status. Consumers have incentives to purchase Top Runner vehicles due to lower automobile acquisition tax rates and gasoline savings over the life of the vehicle.

Taxes

As of August 2005, average end-use taxes on gasoline in Japan were approximately US$ 0.55/ liter ($2.08/gallon). End-use taxes represent approximately 45% of the total price per liter of gasoline.[93]

The Japanese Government has been considering the implementation of an "environmental tax" for all economic sectors for several years. However, opposition from Japanese industry as well as several key ministries has led the Government to reconsider the tax. The Government emphasizes the importance of voluntary emission reductions among industry as an alternative to regulatory measures.[94]

R&D

With respect to R&D, Japan spent U.S. $30.6 million in 2003 on R&D for the transport sector.[95] The funding is aimed at developing new-generation, energy-saving transport methods in all sectors, such as alternative fuel and/or passenger vehicles, more efficient rail cars and systems, new materials for aircrafts, and development of "eco-ships."[96]

Deployment incentives

Japan established the Action Plan on Promoting Low-Pollution Vehicles in 2001 with the aim of deploying 10 million low-pollution vehicles and 50,000 fuel-cell cars by 2010. The plan focuses on replacing government vehicles, as well as providing tax incentives for private purchasers.[97] In 1999, the Japanese Government revised vehicle tax rates such that vehicle acquisition tax rate, normally set at 5%, was lowered by 2.7% for vehicles qualifying as low-emissions vehicles. Consumers who purchase hybrid vehicles are eligible for a vehicle acquisition tax rate deduction.[98,99]

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[91] The current Top Runner Standards for different weight categories of vehicles range from 15 to 50 mpg by 2010 (6.4 to 21.2 kilometers per liter of gasoline). Specific Details of the Top Runner Target Product Standards, Chapter 7, http://www.eccj.or.jp/top_runner/pdf/top_runner_e.pdf
[92] http://www.eccj.or.jp/databook/2001e/05_04.html
[93] End-User Petroleum Product Prices and Average Crude Oil Import Costs, IEA, August 2005. http://library.iea.org/Textbase/stats/surveys/mps.pdf
[94] International Environment Daily, Japan to 'Consider' Environmental Tax, Greenhouse Gas Emissions Policy Says, March 31, 2005. http://subscript.bna.com/SAMPLES/ied.nsf/0/1b205fb945d4c5e385256fd5001fe815?OpenDocument
[95] Based on year 2004 dollars and exchange rates. IEA R&D Database, http://www.iea.org/rdd/eng/ReportFolders/Rfview/Explorerp.asp
[96] http://unfccc.int/resource/docs/natc/japnc3.pdf
[97] http://www.iea.org/dbtw-wpd/textbase/pamsdb/detail.aspx?mode=cc&id=674
[98] http://www.env.go.jp/en/rep/aret/ch3.html

Canada

Canada employs strategies similar to those in the U.S. to address its transport sector emissions. As part of its strategy to meet its national emissions target under the Kyoto Protocol, the Government has established a number of programs including fuel efficiency standards, agreements with industry, programs to develop and deploy lower emitting vehicles and fuels, and programs to increase awareness of CO_2 emissions from personal transport and encourage citizens to reduce their transport emissions.

Fuel efficiency policies

In 1976, Canada introduced the Company Average Fuel Consumption (CAFC) goal for fuel efficiency of new passenger vehicles. The CAFC is equivalent to CAFÉ standards in the U.S. and is updated each year for passenger vehicles and light duty trucks to match U.S. standards.[100]

Agreement with industry

In April 2005, the International Automobile Manufacturers of Canada and the Canadian Vehicle Manufacturers' Association reached an alternative voluntary agreement with the Government. The Government and manufacturers agreed that total GHG emissions from new vehicles will be reduced by 5.3 megatonnes/year by 2010. This would be equivalent to a 6% reduction from 2010 business as usual (BAU) emissions for new light duty vehicles.[101] To achieve the 2010 target, the Canadian automobile industry will promote fuel-saving vehicle technologies, including hybrid powertrains, cylinder deactivation technology, advanced diesel technology, and emerging technologies.[102]

Taxes

As of August 2005, average end-use taxes on gasoline in Canada were approximately US$ 0.24/ liter ($0.91/gallon). End-use taxes represent approximately 32% of the total price per liter of gasoline.[103]

Research and Development

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[99] http://www.consumersinternational.org/shared_asp_files/uploadedfiles/BF447CA4-485C-4ACF-AE8E-406AB1DC749A_Doc309.pdf

[100] "Comparison of Passenger Vehicle Fuel Economy and GHG Emission Standards Around the World," The Pew Center for Global Climate Change, December 2004. http://www.pewclimate.org/docUploads/Fuel%20Economy%20and%20GHG%20Standards%5F010605%5F110719%2Epdf

[101] Automobile Industry and Government Agree on Climate Change Action, April 5, 2005, http://www.nrcan-rncan.gc.ca/media/newsreleases/2005/200522_e.htm; Memorandum of Understanding between the Government of Canada and the Canadian Automotive Industry Respecting Automobile Greenhouse Gas Emissions, April 5, 2005, http://www.nrcan-rncan.gc.ca/media/mous/2005/20050405_e.htm

[102] ibid.

[103] End-User Petroleum Product Prices and Average Crude Oil Import Costs, IEA, August 2005. http://library.iea.org/Textbase/stats/surveys/mps.pdf

Question 1. Point of Regulation
Richard Rosenzweig/ Natsource LLC

With respect to transport R&D, the Government has provided $62 million for R&D into fuel cells and other related technologies. There are four demonstration projects underway through Action Plan 2000. They are intended to provide knowledge about the infrastructure that would be required to fuel these vehicles and, thereby, further the development of the hydrogen economy in Canada. Bio-fuels R&D have received $23 million funding towards biomass and waste conversions, cellulosic ethanol from biomass and other bio-fuels; bio processes; biomass production, harvesting and transportation; and energy from biomass. The Government has also provided $9.3 million in support for research and demonstrations of biodiesel use and in incentives for industrial-scale biodiesel pilot plants.

Deployment incentives

The Government of Canada is also focusing on developing and deploying lower emitting vehicles and fuels to increase fuel efficiency and reduce GHG emissions. Canada has set a target under the Future Fuels Initiative to increase ethanol fuel use from the current level of 240 million to 1 billion liters in 2010. This would be enough ethanol to blend into 25% of total gasoline volume, compared with 7% today.[104,105]

[104] Climate Change Plan for Canada, Government of Canada, 2002, http://www.climatechange.gc.ca/plan_for_canada/plan/pdf/full_version.pdf
[105] http://www.oee.rncan.gc.ca/transportation/fuels/ethanol/future-fuels-initiative.cfm?attr=8

Question 1. Point of Regulation
Richard Rosenzweig/ Natsource LLC

Clarifying Question 1b:

- What is the most effective place in the chain of activities to regulate greenhouse gas emissions, both from the perspective of administrative simplicity and program effectiveness?

Please begin your response HERE. (no page limit)

Question 2. Allocation
Richard Rosenzweig/ Natsource LLC

Should the costs of regulation be mitigated for any sector of the economy, through the allocation of allowances without cost? Or, should allowances be distributed by means of an auction? If allowances are allocated, what is the criteria for and method of such allocation?

Please submit your response HERE. (no page limit)

Question 2. Allocation
Richard Rosenzweig/ Natsource LLC

Clarifying Questions 2a:

Technology R&D and Incentives

- What level of resources should be devoted to stimulating technology innovation and early deployment?
- What portion, if any, of the revenues from permits or the auction of allowances should be reserved for technology development? If some portion is reserved for this purpose, should that set-aside flow to the federal government with funds spent through the traditional appropriation process? Or should the funds be allocated directly to a non-profit research consortium, chartered by the federal government, which would then administer technology development and deployment projects? Or should there be some combination of these two options?
- What criteria should be used to determine how such funds are spent and which projects are chosen?
- What other mechanisms should be used to promote technology deployment? Options include tax credits, cost-sharing for demonstration projects, assistance to state energy programs, etc.

Please begin your response HERE. (no page limit)

Question 2. Allocation
Richard Rosenzweig/ Natsource LLC

Clarifying Questions 2b:

Adaptation Assistance

- What portion of the overall allowance pool should be dedicated to adaptation research or adaptation-related activities?
- How should these allowances or funds be administered?
- What is the appropriate division between federal vs. regional, state, and local initiatives?

Please begin your response HERE. (no page limit)

Question 2. Allocation
Richard Rosenzweig/ Natsource LLC

Clarifying Questions 2c:

Consumer Protections

- What portion of the overall allocation pool should be reserved to assist consumers?
- Should funds from the sale of permits or allowances be targeted primarily to low-income consumers, or should they be more widely distributed to benefit all consumers?

Please begin your response HERE. (no page limit)

Question 2. Allocation
Richard Rosenzweig/ Natsource LLC

Clarifying Questions 2d:

Set-Aside Programs

- What portion of the allocation pool should be reserved for the early reduction credit program and the offset pilot program?

This comment does not specifically answer the question above. It more specifically identifies key issues that must be considered in the design of a greenhouse gas (GHG) offset system. In general, Natsource supports the use of offset systems to comply with greenhouse gas reduction targets based on our view that, if structured correctly, offset systems can provide economic and environmental benefits. Such systems have not always functioned as originally envisioned. The discussion below is based on Natsource's staff experience in designing offset programs and trading systems as senior government officials in the Legislative and Executive branches of government and our role as the largest private sector buyer of greenhouse gas (GHG) offsets created by projects in the international market.

This policy and market expertise provides Natsource with a unique understanding of how policy design will affect the creation of offsets and market behavior and pricing. Natsource staff was involved in the development of many of the programs which have been developed to create GHG offsets. Our staff: (1) have been involved in the development of the Clean Development Mechanism, which creates Certified Emission Reductions (CERs) under the Kyoto Protocol (KP) and which governments and private firms can use to comply with reduction targets; (2) regularly participate in the CDM's deliberations; (3) served on the resource panel for the Regional Greenhouse Gas Initiative (RGGI), an effort of seven Northeastern States which will limit covered power plant emissions and which will allow firms to use offsets to comply with emissions caps; and, (4) have undertaken significant analysis of the Canadian Government's efforts to design an offset program as an element of their strategy to comply with their obligations under the KP.

Concerns with the environmental integrity and economic performance of programs allowing for the creation and use of offsets have been raised since these programs' inception. As noted in Senator Domenici's and Senator Bingaman's discussion paper, "Design Elements of a Mandatory Market-Based Greenhouse Gas Regulatory System,"

> While offset projects can provide a very low-cost and efficient means of achieving reductions, many projects of this type also present significant challenges in terms of measuring, monitoring, and verifying emission reductions.

There are several issues that would need to be considered in order to strike an effective balance between environmental integrity and economic efficiency in designing a U.S. domestic offset program. These key issues are briefly described below.

Question 2. Allocation

Richard Rosenzweig/ Natsource LLC

Key Issues Affecting Economic and Environmental Performance of Offset Programs

Complexity/Transaction Costs: Offset programs have been adversely impacted by complex rules which govern offset creation. The complexity of these rules discourages investment due to regulatory risk and increases transaction costs.

Additionality: Most offset programs employ a concept known as additionality to determine if project activities are eligible to create offsets. At its most basic, an additionality test requires a project proponent to demonstrate that the project activity creates reductions that would not occur in the absence of the project. This is known as environmental additionality. More rigorous additionality tests also require that proponents demonstrate that the project activity would not have occurred under business as usual scenario' which ultimately calls for proof of intent. Some programs carry additionality quite far, including the CDM. This has encouraged use of other additionality tests including investment or financial additionality. These tests attempt to answer the question as to whether the project activity would have been implemented absent the revenue stream created by the offset. This is an extremely controversial issue within the CDM. Overly stringent additionality tests can have significant negative impacts on levels of project investment, risk and transaction costs.

Environmental Integrity: In cap and trade programs without offsets (and/or price caps), all reductions must be achieved by entities subject to the cap within their own assets. Thus, provided the monitoring and compliance regimes are appropriate, the environmental outcome is assured by the cap. Offset programs are controversial because entities covered under the cap are allowed to achieve compliance by purchasing offset "credits" that are created outside of the sector/activity subject to the cap. This raises environmental integrity concerns. Two major concerns are: 1) that emissions accounting for offset creation will not be not as rigorous as the accounting requirements for capped sources; and, 2) that non-additional activities will be granted offsets, which means that on a global basis some portion of the program's environmental objective will not be achieved. Measures to address these concerns have often resulted in cumbersome offset creation rules and procedures that increase risk and transaction costs.

Restrictions on Offset Creation: Some offset programs impose geographic limits as to where offsets can be created and/or the types of activities that are eligible to create offsets. These restrictions will reduce the economic benefits of such programs.

Equity Issues

Supplementarity. A supplementarity requirement imposes quantitative limitations on the use of offsets for compliance with emissions limitations. Critics of offset programs believe that they enable emitters to buy their way out of emission reduction requirements through offset purchases and avoid making the necessary emissions reductions within their own assets. Taken to its extreme, a cap and trade program could result in no on-system reductions if there are no restrictions on offset use. For this reason offset critics seek limits on the use of offsets for compliance to ensure that a specified portion of reductions come from capped sources. Imposing limits on the use of markets for compliance can have the effect of reducing economic benefits and driving up the cost of the program.

Free Ridership: Free ridership refers to the possibility that entities that were already making investments in reductions would secure offsets for these investments. The "free riders" would sell offsets into the capped sector, thereby gaining economic windfalls and undermining the environmental integrity of the cap and trade program. Additionality tests are designed to eliminate free ridership. However, additionality tests must balance between eliminating 100% of free ridership and screening out valid projects and/or driving up risk and transaction costs to the point where investment in valid project activities is discouraged.

Relationship of the Program to Other Elements of Program Design

Offset programs are included in larger trading programs that have been developed to achieve environmental objectives cost-effectively. The following issue relates to the ways in which offset programs interact with other key elements of emissions trading programs and the potential effects of such interactions.

Interaction With Price Cap: Environmental integrity concerns are often expressed regarding the inclusion of price caps in trading programs. This is because once the price cap is reached; firms are no longer required to achieve the environmental performance goal of the cap program. They simply pay their way out, which results in less environmental benefit. Opposition to offset programs has also been based on environmental integrity concerns. However, offsets may improve the environmental integrity of a trading program which includes a price cap by encouraging environmentally beneficial activities that would not occur without the offset program. Such activities will only take place to the extent the offsets can be created at prices below the cost cap.

Potential Design Approaches that Could Address the Challenges

Some potential solutions to the many challenges described above follow.

Standardized Baselines: The offset program could allow for credit creation through the use of standardized baselines for specific activity types. This would provide developers with increased certainty and reduced transaction costs.

Prequalification and Crediting Guidelines: The offset program could allow prequalification for credit.

Two-Phase Approach: Under a two-phase approach, offset proponents would go through an abbreviated pre-qualification process to determine if the activity were eligible to create offsets and how they would be quantified. Only those projects that pre-qualified would then undergo the more rigorous process to secure the offsets. This two-step process would enable project proponents to better manage risk and make it easier to secure financing.

Question 2. Allocation
Richard Rosenzweig/ Natsource LLC

Clarifying Questions 2e:

Special considerations for fossil-fuel producers?

- Would some upstream fossil fuel producers be unable to pass the cost of purchasing permits or allowances through in fuel prices if they are the regulated entity?
- Is there a sufficient policy rationale for addressing these costs to justify the complexity of setting up and administering an allocation system for these entities?
- What other options exist to address the inability of fossil fuel producers to pass through these costs?

Please begin your response HERE. (no page limit)

Question 2. Allocation
Richard Rosenzweig/ Natsource LLC

Clarifying Questions 2f:

Allocations for downstream electric generators?

- Should electricity generators be included in the allocation if they are not regulated? (Clarification: We mean to ask if an electric generator should be included in the allocation if the greenhouse gas regulation occurs at a point of regulation that is upstream or downstream from the generator, but not the generator itself.)
- What portion of the total allocation should be granted to the electric power sector? Should it be based on the industry's share of greenhouse gas emissions or some other factor?
- Should generators in competitive and cost-of-service markets be treated differently under an allocation scheme?
- How should permits or allowances be distributed within the electric sector? Should it be based on historic emissions? Electricity output? Heat input?

Please begin your response HERE. (no page limit)

Question 2. Allocation
Richard Rosenzweig/ Natsource LLC

Clarifying Questions 2g:

Allocations for energy-intensive industries?

- Is there a sufficient policy rationale to have an allocation to selected energy-intensive industries? What industries should be included in the allocation?
- What portion of the overall allocation framework should be reserved for these industries?
- What are the appropriate metrics for determining allocations across different industries?

Please begin your response HERE. (no page limit)

Question 2. Allocation
Richard Rosenzweig/ Natsource LLC

Clarifying Questions 2h:

Allocations to other industries/entities?

- What other industries/entities (e.g. agriculture, small businesses, etc.) should be considered in the allocation pool?
- What should be the basis for their share of the total allocation as well as for the distribution among such industries/entities?

Please begin your response HERE. (no page limit)

Question 3. International Linkage
Richard Rosenzweig/ Natsource LLC

Should a U.S. system be designed to eventually allow for trading with other greenhouse gas cap-and-trade systems being put in place around the world, such as the Canadian Large Final Emitter system or the European Union emissions trading system?

Please begin your response HERE. (no page limit)

Question 3. International Linkage
Richard Rosenzweig/ Natsource LLC

Clarifying Question 3a:

- Do the potential benefits of leaving the door open to linkage outweigh the potential difficulties?

There are significant benefits to linking a U.S. greenhouse gas (GHG) program to other cap-and-trade systems which would outweigh the potential difficulties. However, key issues need to be carefully considered in linking the programs (see following paragraphs). Linking to a program such as the EU Emissions Trading Scheme (EU ETS) would provide additional incentives to U.S. covered sources to achieve domestic emission reductions that could be sold in either domestic or international markets. If the U.S. linked to a program in which marginal costs of abatement were lower than in the U.S., linking could also lead to significant compliance cost savings for U.S. covered sources. Linking would make the emissions market deeper and more liquid, and would allow for better price discovery. It would also facilitate efficient emission reductions within and between companies with operations in multiple countries. Finally, it would set the precedent for future linking efforts, and would help create a more liquid, efficient GHG market in which emission reductions are implemented where they are most cost-effective, and in which overall costs of meeting targets are minimized. In the 1990s, the U.S. was one of the leading supporters of emissions trading as a cost-effective means of meeting emission reduction objectives, and of the creation of efficient global GHG markets to address climate change. The U.S. can set an important example for future efforts by linking to international markets.

Question 3. International Linkage
Richard Rosenzweig/ Natsource LLC

Clarifying Question 3b:

- If linkage is desirable, what would be the process for deciding whether and how to link to systems in other countries?

The benefits of linking a U.S. GHG cap-and-trade program to another program, and potential obstacles to such linking, would vary depending upon the design features of the U.S. program and the other program in question. Therefore, the process for deciding whether and how to link to a specific system would need to begin with a detailed review of the design features of each program, and a consideration of differences between programs that could pose obstacles for linking and/or that could reduce the benefits of linking.

The table below summarizes some of the key differences between the proposal for a U.S. trading program introduced by Senator Bingaman in 2005, legislation by Senators McCain-Lieberman to create a trading program, and the EU Emissions Trading Scheme.

Table 1: EU ETS vs. U.S. emissions trading programs: Comparison of main features

	Bingaman Proposal	McCain-Lieberman Proposal	EU ETS
GHG covered	Broader coverage than McCain-Lieberman, because all upstream sources are covered.	85% of national GHG emissions.	CO_2 emissions from the combustion of fossil fuels (approximately 45% of emissions are covered).
Trading system	Mandatory trading program for all upstream sources plus downstream sources of process emissions; program's overall annual targets based on emissions intensity targets, but sources are assigned absolute emissions targets.	Mandatory cap-and-trade system for large emitters in the energy sector and selected industrial sectors, and for upstream suppliers of transport fuels, based on absolute emissions targets.	Mandatory cap-and-trade system for large emitters in the energy sector and selected industrial sectors, based on absolute emissions targets.
Tradable units	U.S. allowances; allowances for eligible early reductions (i.e. prior to 2010); payment at the safety valve price; allowances for eligible offset project activities, but not allowances, offsets or credits that are issued by a foreign country; and credits for 1) long-term geologic CO_2 sequestration, 2) use of covered fuels as feedstocks, 3) exports of covered fuels, and 4) destruction or export of HFCs, PFCs, SF_6 or N_2O.	U.S. allowances; tradable allowances from another nation's market; a registered net increase in sequestration; a registered GHG reduction (i.e. eligible offset); or a credit against future reductions.	EU allowances (EUAs), CERs and ERUs (excluding nuclear power and LULUCF projects)
Trading periods	Initial targets set for 2010 – 19.	Initial targets set for 2010 – 15.	Phase 1: 2005 – 2007. Phase 2: 2008 – 2012.

	Bingaman Proposal	McCain-Lieberman Proposal	EU ETS
Allocation of permits	Total allocation in 2010 equal to forecasted GDP multiplied by emissions intensity target equal to 2.4% below 2009 forecasted intensity; each subsequent year the intensity target is reduced by 2.4%; the grandfathered percentage starts at 91% in 2010, and decreases to 87% in 2020.	All covered sources receive free allowances roughly equal to their year 2000 emissions.	Responsibility of Member States (phase 1: mostly free allocation based on historical emissions).
Sanctions	Penalty equal to three times the safety valve price for that year for each allowance not submitted. Failure to pay penalty would result in civil penalties of not more than $25,000 per day of violation.	Penalty equal to three times the market value of a ton of GHG emissions.	Penalty of EUR 40 (phase 1) and EUR 100 (phase 2) and obligation to cover deficit in subsequent period.
Monitoring, reporting and verification	Monitoring and reporting standards and rules to be developed; annual reporting.	Monitoring and verification standards to be developed; annual reporting.	Monitoring of each installation, verification by independent entities
Price cap	Price cap ("safety valve") price of US $7 per metric ton CO_2e in 2010, increasing 5% per year thereafter.	No price cap.	No price cap.

The proposed U.S.-based trading programs share some features of the EU ETS, but differ from the EU ETS and each other on a number of key issues. The following discussion briefly highlights some of the key differences between the programs, and the implications of these differences in the context of linking. Natsource has provided analysis on these issues, and can develop further analysis exploring different policy options to address them. Many of the challenges of linking can be addressed through various policy options.

Eligible compliance instruments

Senator Bingaman's proposal would allow for use of several GHG reduction types which would not be allowed under the EU ETS. It also would allow for safety valve payments, which raises other issues (see separate discussion on price caps below). Importantly, Senator Bingaman's proposal would not allow for use of "credits or allowances issued by a foreign country." Therefore, reductions created by the project-based mechanisms incorporated in Articles 6 and 12 of the Kyoto Protocol (KP) would not be eligible for compliance.

The McCain-Lieberman proposal would allow "allowances from another nation's market" to be used for compliance. McCain-Lieberman does not appear to allow for the use of reductions created by the project-based mechanisms incorporated in Articles 6 and 12 of the KP, but would allow for use of the following reduction types: registered increases in sequestration, eligible domestic offsets, and credits against future reductions (i.e. "borrowing"). None of these reduction types would be eligible under the EU ETS.

Differences between programs regarding eligible compliance instruments may create concerns that an instrument which is not eligible for compliance in the U.S. will be able to enter the U.S. trading system via the linked system, and vice versa. For example, upon receiving payment from an EU installation for a U.S. allowance, a U.S. firm could use the proceeds to purchase a registered increase in sequestration. If such sequestration credits are priced lower than U.S. Allowances and EU Allowances, linking the systems would increase the amount of sequestration tons purchased by U.S. firms relative to a no-linking scenario. Thus, EU installations would effectively be able to use U.S. sequestration tons for compliance, and the EU's restrictions could thereby be circumvented.

In addition to raising issues relating to compatibility of eligible compliance instruments, linking a U.S. system to the EU ETS would create challenges for the EU's ability to comply with its target under an international regime. The EU would need to consider the possibility that any purchases of U.S. GHG instruments would not be eligible for its compliance with its national target. This would be true if the U.S. linked its program with Canada's Large Final Emitter program that is underdevelopment.

Lastly, there are questions regarding whether the U.S. programs, in their current form, would be open to linking. The McCain-Lieberman bill would accept allowances from another nation's market, but Senator Bingaman's approach would not do so in its current form.

Use and implementation of price caps

The proposal developed by Senator Bingaman allows covered entities to make a payment at the safety valve price in lieu of submitting a compliance instrument. The safety valve price will be $7 per metric ton CO_2e in 2010, increasing 5% per year thereafter. The safety valve would effectively cap compliance costs under the program at the safety valve price.

This price cap could pose a significant obstacle to linking with the EU ETS. In the case of the proposal developed by Senator Bingaman, if safeguards are not implemented, U.S. firms could sell all of their allowances to EU buyers and comply for $7/ton. One possible approach for minimizing this arbitrage would be to limit use of the price cap to the difference between a U.S. firm's emissions and its emissions target.[1]

In practice, the price cap would segment the market. It would immediately place EU buyers on different footing from U.S. buyers, as the U.S. Government would not provide $7 compliance instruments to the EU buyers in order to lower their compliance costs. Presumably, EU buyers, who would not have access to the price cap, would be able to buy U.S. allowances offered at prices higher than the price cap (assuming that prices in the EU market will be higher than $7). This segmentation would reduce the economic efficiency benefits of the system as a whole. U.S. sellers may be able to sell allowances to EU buyers at levels higher than their (the U.S. sellers') marginal costs of abatement, since prices in the EU segment of the U.S. market would tend to converge upward toward EU prices. This upward price convergence, in turn, could lead to

[1] This option was recommended in Blyth and Bosi, "Linking Non-EU Domestic Emissions Trading Schemes," International Energy Agency, 2004.

greater use of the price cap in the U.S., and fewer emissions reductions than in a no-linking scenario.

Stringency of targets and "comparability of effort"

The McCain-Lieberman legislation proposes targets that are similar to the EU ETS in terms of stringency. However, in its current form Senator Bingaman's proposal incorporates considerably less stringent targets. This could raise concerns over comparability of effort. The McCain-Lieberman proposal sets caps at 2000 levels from 2010-15.

The overall target in Senator Bingaman's approach in 2010 would be equal to forecasted GDP multiplied by an emissions intensity target equal to 2.4% below 2009 forecasted intensity. Each subsequent year the intensity target would be reduced by 2.4%. This would mean that in 2019, the emissions intensity target would be approximately 22% below 2009 emissions intensity levels, which appears to be a substantial reduction. However, if U.S. GDP grows by an average of 3.2% per year between 2010 and 2019 (the average rate from 1995-2004[2]), the total allocation under this proposal would be 7.5% higher than 2009 levels in 2019.

In 2008-12, in order to meet national emission reduction targets and the EU's overall target under the Kyoto Protocol of 8% below 1990 levels in 2010, most EU Member States will set emission reduction targets for EU ETS sectors at levels between 1990 and 2000 levels.

The fact that Senator Bingaman's approach would be less stringent than the EU ETS would raise concerns in Europe that: 1) U.S. firms would not undertake emission reduction efforts comparable to those in the EU, and that this is inequitable; 2) U.S. firms would be able to profit from significantly less stringent standards by selling excess reductions to EU firms; and 3) EU firms would make significant use of lower-priced U.S. allowances to meet compliance requirements rather than implementing internal emission reductions.

Compliance penalties

The EU ETS imposes a penalty for non-compliance of €40/ton in 2008-12 and €100/ton in 2008-12. Firms that fail to meet compliance requirements are also required to pay back their compliance shortfall (in tons) in the subsequent year. The McCain-Lieberman proposal has a fairly stringent financial penalty for non-compliance (three times the market value of a ton of GHG emissions), but does not have an environmental penalty involving "payback" of tons. The proposal developed by Senator Bingaman incorporates a price cap of US $7 per ton in 2010, and imposes a penalty for non-compliance equal to three times the safety valve price for that year for each allowance not submitted. It does not impose environmental penalties. The availability of the safety valve would allow firms to pay a fairly low-cost penalty to the Government rather than meeting compliance requirements.

Linking the EU ETS to the Bingaman program likely would raise concerns that linking would undermine the environmental integrity of the EU ETS system, since it could be argued that the

[2] U.S. Bureau of Economic Analysis, "Gross Domestic Product," http://www.bea.gov/bea/dn/nipaweb/SelectTable.asp?Popular=Y (accessed February 20, 2006).

Question 3. International Linkage
Richard Rosenzweig/ Natsource LLC

U.S. program would not meet its target level of emissions due to the availability of the safety valve. In addition, it is likely that linking the EU ETS to the U.S. program would result in an increase in U.S. emissions compared to a no-linking scenario. If EU ETS prices are higher than U.S. prices (which appears certain if the U.S. program had a $7 safety valve), EU buyers would purchase U.S. allowances, pushing U.S. prices up to the safety valve price, and leading to greater use of the safety valve for compliance and therefore higher emissions.

Clarifying Question 3c:

- What sort of institutions or coordination would be required between linked systems?

The central element of implementing a linking arrangement would be for the relevant governments to confirm in law or regulation that allowances in the other program would be recognized for compliance under the domestic trading program. However, before this final stage is reached, it likely that the key ministries responsible for implementing the trading programs would engage in discussions to identify key issues that must be resolved in order to link the two systems. The EU is reportedly engaged in similar discussions with the Regional Greenhouse Gas Initiative in the Northeastern U.S., Norway, Canada, Australia and Switzerland.[3]

Other elements which would need to be coordinated in order to link systems include the linking of registries which track trading of emissions instruments in and out of countries and covered sources' accounts. By the time a U.S. trading program is implemented, there will have been significant experience with the development and implementation of registry systems in countries that are signatories to the Kyoto Protocol.

[3] Point Carbon, Carbon Market Europe, March 3, 2006, via www.pointcarbon.com.

Question 4. Developing Country Participation
Richard Rosenzweig/ Natsource LLC

If a key element of the proposed U.S. system is to "encourage comparable action by other nations that are major trading partners and key contributors to global emissions," should the design concepts in the NCEP plan (i.e., to take some action and then make further steps contingent on a review of what these other nations do) be part of a mandatory market-based program? If so, how?

Natsource is not answering any of the key questions asked in this section. We have undertaken a significant amount of work for the National Commission on Energy Policy (NCEP) in their assessment of the efforts of both developed and developing and countries in addressing the climate issue and in developing their recommendations for a U.S. program.

Natsource developed a range of metrics to assess the performance of eight developed countries and four developing countries in addressing climate change. The metric focused on: (1) environmental performance; (2) efforts in developing a market based framework to reduce compliance costs; (3) efforts to deploy lower emitting technologies in the market place through a range of policies; and (4) to develop technologies that will be necessary to achieve the steeper reductions that will be required to achieve the long-term goal incorporated in the United Nations Framework Convention on Climate Change (UNFCCC) of stabilizing atmospheric concentrations of GHGs in the atmosphere.

Natsource scored these efforts through a qualitative and quantitative approach. We would be happy to share this work and communicate the results of it with the committee in its development and consideration of climate change policy.

Question 4. Developing Country Participation
Richard Rosenzweig/ Natsource LLC

Clarifying Question 4a:

- What metrics are most valuable for comparison of developed and developing country mitigation efforts to U.S. efforts?

Please begin your response HERE. (no page limit)

Question 4. Developing Country Participation
Richard Rosenzweig/ Natsource LLC

Clarifying Question 4b:

- What process should be used to evaluate the efforts of other nations and how frequently should such an evaluation take place?

Please begin your response HERE. (no page limit)

Question 4. Developing Country Participation
Richard Rosenzweig/ Natsource LLC

Clarifying Question 4c:

- Are there additional incentives that can be adopted to encourage developing country emission reductions?

Please begin your response HERE. (no page limit)

Pew Center

Submitter's Name/Affiliation: **Eileen Claussen, Pew Center on Global Climate Change**
Contact: Nikki Roy**;** Email: royn@pewclimate.org; Phone: 703-516-0633

The Pew Center applauds the Senate Energy Committee for its continued efforts to address the critical issue of climate change. The Center is responding to all four main questions, and submitting additional information on cost containment and recent climate science. Responses draw from an extensive body of analysis, conference and workshop proceedings undertaken by the Center with input from the Center's Business Environmental Leadership Council, scholars, policymakers, and stakeholders; as well as opinions expressed to the Center in discussions with over 30 large corporations. Please note that the Center and most companies surveyed believe that, rather than focusing on any one design element in isolation, any bill must be evaluated as a whole, especially in minimizing the costs to covered entities and the economy.

1. Point of Regulation: Ultimately mandatory GHG mitigation measures should cover the economy as a whole, equitably spreading responsibility among large emitters, the transportation sector, and households. For large stationary sources, the submission of allowances would best be required "downstream" at the point of emission, rather than "upstream." For the transportation sector, the Center recommends an approach that would cover vehicle manufacturers through use of tradable vehicle GHG emission standards.

2. Allowance Allocation: To assist with the transition to GHG regulation, a high percentage of allowances (e.g., 90% - 95%) should be allocated at no cost, rather than auctioned, at least in the initial years of a cap-and-trade system. A small initial auction can provide funds for transition assistance and technology deployment. Over time, the amount auctioned could increase. In providing federal funding for technology development, a competitive process, such as a "reverse auction," allocating funding on the basis of emission reduction potential, can minimize costs. In the early years of the program, the highest priorities for allocation should be transition assistance and technology development; over time the priorities should shift toward rewarding low-emitting technologies and practices. Offsets are critical for minimizing program costs. Use of offsets to meet allowance submission requirements should not be restricted, as long as the offsets meet reasonable standards for real, verifiable emission reductions. Early action credit is important and could be provided by allowing emitters who document emission reductions earlier than the default baseline year to use an earlier baseline, resulting in a higher allowance allocation.

3. Linkage: A U.S. GHG program should be integrated with systems around the world. This is both environmentally and economically important. Linkage will minimize costs while expanding GHG mitigation and technology transfer opportunities. Use of a low safety valve will greatly complicate such linkage and minimize the incentive for technology transfer and innovation.

4. Encouraging Comparable Action: Different policies are needed to address two distinct but related objectives: (1) achieving adequate action by all major emitting countries, and (2) protecting U.S. firms in energy-intensive industries whose goods are traded internationally against competitiveness impacts. The first is best achieved through multilateral commitments; the second through overall cost containment and targeted support for the vulnerable sectors.

Additional Topics - Cost Containment: A "safety valve" is just one cost containment method. Costs to regulated entities can also be minimized through offsets, allocation, linkage, etc. Climate Science: The evidence of globally-distributed climate change impacts is mounting.

Question 1. Point of Regulation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Who is regulated and where?

Clarifying Question 1a:

- Is the objective of building a fair, simple, and rational greenhouse gas program best served by an economy-wide approach, or by limiting the program to a few sectors of the economy?

Please begin your response HERE. (no page limit)

Pew Center Response

The Pew Center's responses to these questions draw from two sources:

- An extensive body of analysis, conference and workshop proceedings, and other work undertaken by the Pew Center from 1998 to the present with input from the Center's Business Environmental Leadership Council[1] (BELC), leading scholars, policymakers, and stakeholder groups. This work provides the foundation for the Pew Center's positions on these design questions. Documentation of this work is available at the Pew Center website www.pewclimate.org. Information about the BELC and its 41 member companies can be found at: http://www.pewclimate.org/companies_leading_the_way_belc/.

- Opinions expressed to the Pew Center in dozens of hours of discussion over several years with over 30 large corporations regarding design elements of a greenhouse gas (GHG) cap-and-trade program. The companies include several large utilities as well as companies in other sectors, ranging from primary fuels to manufacturing to retail. Although the Pew Center and the companies with which the Center has discussed design elements agree on the broad outlines of a cap-and-trade program, individual company opinions may or may not agree with the Center's positions on particular issues.

As reflected in the Center's 15-point "Agenda for Climate Action," the Pew Center believes that mandatory GHG mitigation measures must cover the economy as a whole, equitably spreading responsibility for reducing emissions among large emitters, the transportation sector, and households. The companies surveyed unanimously supported this position.

Because emissions from electricity generation and transportation make up approximately 40% and 30% of U.S. GHG emissions respectively, it is critical to address these sectors sooner rather than later. However, these emissions need not be covered through the same system.

[1] The BELC is the largest U.S. based association of corporations focused on addressing the challenges of climate change, with forty-one members representing $2 trillion in market capitalization and over 3 million employees.

Question 1. Point of Regulation

Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Large stationary sources should be addressed through a cap-and-trade program.[2] A cap on emissions would send an economy-wide signal favoring reductions, and emissions trading would ensure that reductions are achieved at the lowest cost possible. Such a program should cover all GHGs in all major emitting sectors and include all measurable, verifiable reductions and offset measures, without restrictions on trading. An absolute cap for the national program should be set to achieve a modest level of emission reductions and announced sufficiently far in advance to allow for planning (e.g., a return to current levels within a five- to ten-year period). Further reductions should be phased in over time as new technologies come online and capital stock turns over. Because individual sectors have different sensitivities to the price of carbon and are growing at different rates, sector-specific emission limits or allowance allocations within the overall cap could be established.

At the end of a year, each emitter would be required to surrender allowances equal to its emissions. Emitters whose cost of abating emissions was lower than the allowance price could sell allowances or "bank" them for future use. Emitters whose cost of reducing emissions was more than the price of an allowance could buy allowances. This flexibility would allow for the most cost-effective emissions reductions.

The transportation sector is difficult to incorporate into a downstream cap-and-trade program, and should be addressed through requirements on vehicle manufacturers, for example by converting the Corporate Average Fuel Economy (CAFE) program into strengthened, tradable corporate average CO_2 (or GHG) standards. Average fuel economy standards under the current CAFE program could be replaced by corporate average CO_2 emission standards for each manufacturer's combined sales of cars and light trucks. A manufacturer that "overachieves" (whose average emissions are below the standard) in a given year would earn allowances based on the reduction in projected lifetime emissions from vehicles produced in that year. These allowances could be banked, sold to other manufacturers or sold into the broader, economy-wide GHG cap-and-trade program. A manufacturer that does not meet its CO_2 standard would purchase allowances to cover its shortfall.

In order not to penalize any vehicle manufacturer at the start, efforts of those who invested early and exceeded standards would be recognized (for example, through credit allocation) with adequate time provided for other companies to catch up, recognizing the time needed to develop and market new vehicles. Concerns about a lack of price-responsiveness within the transportation sector driving up costs of allowances for stationary sources could be addressed by keeping this program separate from the stationary source cap-and-trade program, or by requiring a certain amount of reductions from within the sector.

[2] See also: Claussen, E., and R. Fri, co-chairs. 2004. A Climate Policy Framework: Balancing Policy and Politics. Ed. J. Riggs. Report of an Aspen Institute Climate Change Policy Dialogue, November 14-17, 2003. Washington DC: The Aspen Institute. Nordhaus, R., and K. Danish. 2003. Designing a Mandatory Greenhouse Gas Reduction Program for the U.S., Arlington, VA: Pew Center on Global Climate Change.

Question 1. Point of Regulation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Since the energy services required by residential, commercial and industrial buildings produce approximately 43% of U.S. CO_2 emissions,[3] a comprehensive climate program must address this sector. Measures such as upgraded building codes and appliance efficiency standards are an important complement to a large-source cap-and-trade program. Incentives for technologies such as combined heat and power could move the country toward net zero-energy buildings.

While it is important to cover all major emitters, policies may address some sectors first – for example, by implementing cap-and-trade for the electric power sector before other sectors. Some of the utilities surveyed indicate a willingness to consider such an approach, provided the design of regulations is sensible and fair, in exchange for the regulatory certainty that a program would provide. Similarly, some companies state that, although GHG legislation ultimately needs to cover the economy as a whole, a cap-and-trade program initially needs to be as straightforward and easy to implement as possible. At least two major utilities, however, say they oppose a bill that excludes buildings and transportation. They state that the program otherwise would create a distortion that moves electricity generation away from the sector most able to make low-cost reductions to captive generation by large electricity users. Almost all the utilities note they have extensive experience and internal capacity gained over many years of compliance with other air regulations and, in many cases, are also experienced in emissions trading of other air pollutants, so they are well prepared to work within a GHG cap and trade system.

Finally, while the objective is to build "a fair, simple, and rational" program, it is important to recognize possible tensions between "fair" and "simple." The Pew Center and all of the companies with which we have discussed design elements agree that fairness calls for all sectors to bear a fair share of the emissions reduction burden. However, implementing a cap and trade bill for large emitters could be a simpler first step than covering other sectors in the same bill. Establishing a large emitter cap and a U.S. GHG trading market could provide a simple, effective platform for integrating transportation, buildings, and other sectors into a GHG regime over time, rather than undertake measures for all sectors simultaneously.

[3] Brown, M., Southworth, F., Stovall, T. 2005. Towards a Climate-Friendly Built Environment, Arlington, VA: Pew Center on Global Climate Change.

Question 1. Point of Regulation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Question 1b:

- What is the most effective place in the chain of activities to regulate greenhouse gas emissions, both from the perspective of administrative simplicity and program effectiveness?

Pew Center Response

The Pew Center and most of the companies surveyed believe that allowance submission should be required "downstream" at the point of emission from large stationary sources, rather than "upstream" (e.g., on producers of coal, oil, and natural gas). To many, a program that applies a cap and trade to upstream producers functions for all practical purposes like a carbon tax, rather than a robust market. Moreover, some research suggests that carbon taxes must be very high and continuous to motivate a significant market response. It is more useful to apply regulation to those in a position to alter the behavior that results in emissions, rather than to apply a tax on firms that have no technology or process options to reduce emissions.

Regarding the special case of transportation emissions, the Pew Center recommends a focus on vehicles – changing the CAFE standard to a tradable emissions approach, as discussed in response to the Question 1a.

Question 2. Allocation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Should the costs of regulation be mitigated for any sector of the economy, through the allocation of allowances without cost? Or, should allowances be distributed by means of an auction? If allowances are allocated, what is the criteria for and method of such allocation?

Pew Center Response

The Pew Center believes that the costs of regulation can be mitigated through the free allocation of many allowances, as well as through other measures, as discussed in the section on "Cost Containment" in the Additional Topics.

The responses to the following questions draw from two sources:

- An extensive body of analysis, conference and workshop proceedings, and other work undertaken by the Pew Center from 1998 to the present with input from the Center's Business Environmental Leadership Council (BELC), leading scholars, policymakers, and stakeholder groups. This work provides the foundation for the Pew Center's positions on these design questions. Documentation of this work is available at the Pew center website www.pewclimate.org. Information about the BELC and its 41 member companies can be found at http://www.pewclimate.org/companies_leading_the_way_belc/.

- Opinions expressed to the Pew Center in dozens of hours of discussion over several years with over 30 large corporations regarding design elements of a greenhouse gas (GHG) cap-and-trade program. The companies include several large utilities as well as companies in other sectors, ranging from primary fuels to manufacturing to retail. Although the Pew Center and the companies with which the Center has discussed design elements agree on the broad outlines of a cap-and-trade program, individual company opinions may or may not agree with the Center's positions on particular issues.

Resolving the question of how to allocate emission allowances will be fundamentally an issue of political acceptability. As observed in the successful acid rain trading program and noted in the Pew Center's previous analytical work (see, e.g., Ellerman et al), there is no appreciable difference in environmental effectiveness in using a free distribution, rather than an auction, to start a program. The environmental benefits accrue from the timing and quantity of reductions – recognizing that a program that starts sooner would require less drastic reductions. In other words, the allocation vs. auction debate is more relevant to political feasibility than environmental outcome. However, there are a number of key considerations and tradeoffs among the various approaches to allocation. The Pew Center does not have a position on the method of allocation, but has led workshops and discussions addressing these many considerations in developing an allocation method. The following response lays out these areas of consideration, and in some cases makes recommendations. It also describes the views of the

surveyed corporations on these issues. More detail on the implications of various allocation options can be found in the attached documents (along with a lengthier discussion on the pros and cons of free allocation).

Pew Center Analysis

Covered entities, especially those with significant compliance obligations and those in energy-intensive industries, will bear costs associated with transitioning into a market-based system for emissions allowances. To assist with this transition, a high percentage of allowances (e.g., 90% - 95%) should be allocated at no cost, rather than auctioned, at least in the initial years of a cap-and-trade system. A small initial allowance auction can fund transition assistance and research, development and deployment of climate-friendly technologies. This auction may serve as a price discovery mechanism to give firms an initial idea of the market price for an emissions allowance. Over time, the amount auctioned could increase, as firms successfully transition into the trading system and the associated expenditures decrease. In providing federal funding for technology development, a competitive process, such as a "reverse auction" in which funding is allocated based on emission reduction potential, can reduce program costs. In the early years of the program, the highest priorities for allocation should be transition assistance and technology development; over time the priorities should shift toward rewarding low-emitting technologies and practices.

The choice of allocation approaches may have strong distributional impacts, and thus may be a very contentious decision. For large point sources, allocation can be made either on the basis of historical emissions or against a sector-specific benchmark or set of benchmarks. Power plant allocations, for example, may be made on an input, net output, or gross output basis. The goal of allocation is to encourage the transition to a cleaner, more efficient generation fleet, but to do so in a way that recognizes that players in the industry have different starting points.

If the point of regulation is at the power plant level, policymakers must also decide whether to allocate allowances to non-emitting generators, and whether allocation will be fuel-specific or fuel-neutral. Allocating allowances to non-emitting generation would create incentives for the expansion of these sources, but may increase the burden on emitting generation. Fuel-neutral allocation may promote fuel switching and efficiency, while similarly increasing the burden on higher-emitting generation sources.

Another important issue is whether subsequent allocations should be fixed at the same level, or should be updated over time. The argument for updating is that a fixed allocation may disadvantage new and growing businesses. However, many economists argue that updating is economically inefficient because it encourages emitters to modify their behavior in order to increase future allocations, rather than simply meet the emissions cap at the lowest cost.[1]

[1] For example, if allowances are distributed per kwh of generation, that would provide an incentive to increase generation, lowering electricity prices and encouraging fuel switching and plant efficiency over end-use efficiency. Some argue that, if allowances are allocated based on average emission rates, updating would not encourage generators with high emissions rates to generate more because they would still have to buy additional allowances to cover their incremental emissions.

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Updating also creates uncertainty for business decisions as well as emissions outcomes. Ultimately, however, the inefficiencies and behavioral consequences of updating are an empirical question. While preliminary evidence on the Ozone Transport Commission NO_X program suggests that behavior is not significantly different in states that update versus those that do not, there is some consensus that the inefficiencies of updating grow as the magnitude of the program grows. (See RGGI Allocation Workshop Summary and Proceedings for more detail on this question.)

A reasonable compromise might be to update over long time periods (e.g., 5 or 10 years), which should not affect economic efficiency significantly and would contribute to a fairer allocation over time.

Another important issue is how to deal with new entrants. Updating automatically does this, but there are other methods that may be useful, especially if updating only occurs infrequently. The simplest is to require new entrants to purchase allowances on the open market. To the extent that allowances are allocated largely to existing sources, this means that new sources would need to purchase allowances from existing sources. Allowances could also be set aside in a "reserve" at a fixed price – this was the approach taken under the U.S. acid rain program. This reserve was never actually used because cheaper allowances were available on the market, but it was an important insurance policy for new entrants. Finally, allowances for new sources could be set aside and given to eligible new sources for free.

A federal cap-and-trade system may either directly allocate allowances, or may "apportion" allowances to the states, which can individually decide how to allocate allowances. (The Regional Greenhouse Gas Initiative does the latter.) Alternatively, the federal government may foster some degree of harmonization by requiring a certain percentage of each state's allowances go to certain purposes or entities, and then permitting states to allocate the remaining percentage as they wish. The Pew Center believes that it is preferable for the federal government to oversee the allocation process. Allocation is politically very difficult; addressing it at the federal level would save considerable state-by-state trouble and create an uneven playing field. In addition, although difficult, federal-level allocation can enable political solutions, which Congress may be able to utilize to reach agreement.[2]

Some analysts believe that a high level of free allocation will result in windfall gains for allowance recipients. The potential for windfall gains depends, for each economic actor, on the relationships between its compliance obligation, its allowance allocation, and its ability to pass along price increases. While windfall gain may accrue to some sectors that are able to pass along price increases (in excess of cost increases); it will not accrue to all firms within that sector and more importantly will not be available to all sectors. Furthermore, because some firms will experience additional costs, free allocation can serve to minimize this impact while still sending the appropriate signal that emission reductions are valuable. There is disagreement among analysts about the degree to which various sectors and firms are able to pass along price increases, and what level of free allocation may compensate those affected.

[2] Further analysis on allocation can be found in Nordhuas, R. 2003. *Designing A Mandatory Greenhouse Gas Reduction Program for the United States.* Arlington, VA: Pew Center on Global Climate Change, pgs. 27 – 29.

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Company Perspectives on Design Considerations

Among the companies the Pew Center surveyed, there was little consensus on the method of allocation. Opinions fell into a small number of distinct "camps" based on financial implications of various allocation methodologies.

The electric power utilities hold the strongest views, but these differ significantly, based largely on the relative carbon intensity of their generating fleets, which in turn corresponds to their fuel mix. Power companies with a relatively low-carbon fuel mix prefer allocation based on electricity output. Power companies with relatively high-carbon fuel mix prefer allocation based on historic emissions. Some manufacturing companies agree with the latter approach, based in part on their interests as large power users and depending on the carbon intensity of the generators supplying their electricity. Power companies in both camps indicate a willingness to consider compromise approaches depending on other aspects of a regulatory design package. Some utilities note that a compromise approach might involve beginning with an input-focused allocation that transitions over a period of years toward a more output-based allocation. Another utility points out the challenge and importance of reconciling differences between regions and economies fueled primarily by coal and regions with abundant natural gas.

Allocation is just one aspect of the larger picture in which all design elements will be considered. Some note that allowance distribution could serve as a means for awarding credit for early action. One utility holds that it is better to minimize the cost impacts on power customers in advance – i.e., at the allocation stage – rather than through the recycling of allowances. Another company suggests allocating allowances based on technology "benchmarking," which would determine a reasonable baseline level that reflects a balance of technologies used across an industry.

Another company suggests that the allocation system can and should be used to encourage the power generation sector to transition from higher carbon-intensity fleet to a lower one. They believe that instead of viewing allocation as a "compensation" issue, it is important to use the allocation process both to create the bridge to a new energy future and to send a message to the power sector of the overall direction Congress wants the industry to take.

One utility makes the important point that allocation is not the driving force on new plant investment decisions – rather, choice of new plants is based on the overall price signal created by the cap and associated flexibility mechanisms. Finally, there were differing opinions among the surveyed companies as to whether the federal or state government should play the role of deciding how much to allocate to individual emitters.

Question 2. Allocation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Questions 2a:

Technology R&D and Incentives

- What level of resources should be devoted to stimulating technology innovation and early deployment?
- What portion, if any, of the revenues from permits or the auction of allowances should be reserved for technology development? If some portion is reserved for this purpose, should that set-aside flow to the federal government with funds spent through the traditional appropriation process? Or should the funds be allocated directly to a non-profit research consortium, chartered by the federal government, which would then administer technology development and deployment projects? Or should there be some combination of these two options?
- What criteria should be used to determine how such funds are spent and which projects are chosen?
- What other mechanisms should be used to promote technology deployment? Options include tax credits, cost-sharing for demonstration projects, assistance to state energy programs, etc.

Pew Center Response

Effective research, innovation, development, and deployment strategies will be critical to enabling a low-carbon energy future. Current levels of federal RD&D need to be significantly increased to reflect parity with other sectors in the U.S. economy (on the basis of RD&D dollars spent per GDP) and with the magnitude of the challenge of enabling a low-carbon energy future. Equally as important, strategies for managing these funds need to be revamped. Current RD&D efforts on low-carbon technologies suffer from a cultural focus on niche markets, inter- and intra-agency "stove-piping," uncertainty caused by the annual appropriations process and cycle, and detrimental Congressional earmarks on scarce funds. The federal government needs a more integrated approach to RD&D in order to focus the appropriate agencies and resources on critical RD&D needs at appropriate times within a long-term R&D framework. Management modeled on the Defense Advanced Research Projects Administration (DARPA) is needed to instill a culture focused on development and commercialization of these technologies, and forward funding would help reduce the level of uncertainty and detrimental earmarks. Public/private partnerships and government procurement have a key role to play as developers and incubators of technology and to foster "learning by doing"—a critical step in bringing down the cost of low-carbon technologies and increasing deployment. While support for breakthrough technologies is often appealing, experts point out that what often appears to be a breakthrough is indeed the result of years of incremental investment and work. Public/private partnerships are an effective vehicle for enabling sustained incremental improvements in the performance and cost of low-carbon technologies.

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Policy-makers should be wary of the dangers of "picking winners" among technologies, but some support to push the likely candidates along can overcome cost barriers that would otherwise be insurmountable.[3] Research has shown that focusing exclusively on technology-push policies (instruments that offer technology funding incentives without motivating a corresponding demand for these technologies) or exclusively on technology-pull policies (mandates that generate demand for advanced technologies without corresponding support for their development) is more expensive than a combination of the two approaches.[4] Opportunities to introduce competition into the incentive process will reduce the costs of the program and avoid picking winners.

A competitive process to distribute incentives will reduce the costs of the program and avoid picking winners. A "reverse auction", in which bidders compete to provide some technology or service for the lowest cost, would allow reduction projects to compete for these incentives on a level playing field. An auction could specify technology categories as well as offer a broad competition to elicit new, as-yet-unknown technologies. Alternative funding mechanisms include forward funding, technology prizes[5], tax rebates, guaranteed government purchase agreements (i.e., renewable energy or IGCC-CCS energy), green loans and public-private partnerships.

The private sector is generally a more efficient engine of technological innovation than the government. The private sector is particularly good at identifying and allocating resources to those technologies that have the best potential to become financially self sustaining, since private investment is almost uniquely profit-oriented and return-driven. One example raised by companies is in energy efficiency programs. If the government creates frameworks incentivizing but not directing the private sector (tax credits, cap and trade rules that allow efficiency-based offsets, etc.) and allowing private companies and investors to easily monetize the value of efficiency investments, there is ample evidence that the private sector can achieve these at costs per kilowatt or BTU lower than those for which the government is an intermediary.

When it comes to large-scale, longer-term technologies, companies note that it can be effective to match private investment with public funding in some way, as in the case of existing partnerships for clean coal, nuclear power, and fuel cells. Companies expressing a view favor direct government investment and guidance for early stages of research development – the pre-commercial stages of product life cycle. Where infrastructure and programs already exist and are successful, (e.g., NIST grants or the Department of Energy's Industrial Technologies Program) these should be used and consistently funded.

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[3] "The 10-50 Solution: Technologies and Policies for a Low-Carbon Future". Washington DC, March 25-26, 2004. Alic, J.; D. Mowery; E. Rubin. 2003. *U.S. Technology and Innovation Policies: Lessons for Climate Change.* Arlington, VA: Pew Center on Global Climate Change.

[4] Goulder, L. 2004. *Induced Technological Change and Climate Policy.* Arlington, VA: Pew Center on Global Climate Change.

[5] A technology prize grants a monetary award for a specific goal in R&D to spur innovative step-changes in technologies. The best-known example has been the 2004 "ANSARI X PRIZE," which was awarded for the first successful private space flight.

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Given the relative advantages of the private sector in generating innovation, while it is important to fund federal R&D and deployment activities for certain climate-friendly technologies, it is also important to design a GHG cap-and-trade program to leave the greatest share of the money in private hands, where it will be most efficiently spent, rather than flowing to the federal agencies. For example, a cap-and-trade program that sets a meaningful target and allocates a high percentage of allowances for free to a large number of covered emitters would likely foster a robust private market in allowances. The money in such a market would stay in private hands, without the government acting as middle-man, creating with minimum waste a direct incentive for every company to deploy climate-friendly technologies and practices.

In 2004, the Pew Center conducted a workshop called "The 10-50 Solution: Technologies and Policies for a Low-Carbon Future,"[6] and published recommendations in several technology areas for types and levels of investment needed. Some specific funding recommendations included:

- International coordination to plan, fund, and deploy coal gasification with CCS trial projects that focus on remaining technical issues and with publicly shared results (e.g., adequately addressing remaining uncertainties will likely require four to six projects, at an estimated cost of approximately $5 billion, and an estimated project lifetime of 10 years)
- Establishment of carbon sequestration trial projects in the United States to validate the integrity of geologic storage (e.g., such validation will likely require four such projects at an estimated cost of approximately $1 billion, and an estimated project lifetime of 10 years)
- Reinvent the U.S. electricity grid to facilitate distributed power generation and consumption in ways that make this new model attractive to utilities, and promote energy storage technologies. The estimated price of this upgrade is in the $100 billion range.

Other mechanisms can provide incentives for deployment without direct funding. These include:

- Carbon capture and sequestration: Development of a regulatory system for sequestered carbon, including clarity about state-federal split of jurisdiction, and about which agencies at both levels have jurisdiction. In addition, companies note that public-private partnership in the development of private sector insurance products to cover various liabilities would reduce the financial uncertainty for those in the CO2 chain of custody.
- Renewables: Development of a uniform system to track renewable energy credits in a consistent way across the country and facilitate trading between multiple state programs; utilities and other companies with interest in generation, as well as firms in the investment community, note the value of improvements to the national power grid that facilitate distributed generation as a driver for renewable energy technology.
- Nuclear power: Expansion of scope of U.S. Department of Energy nuclear waste R&D to options beyond Yucca Mountain

[6] "The 10-50 Solution: Technologies and Policies for a Low-Carbon Future". Washington DC, March 25-26, 2004.

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- Combined heat and power (CHP) and distributed generation (DG): Support for net metering and incentives for uniform grid interconnection standards at the state level. Development of national test beds for new electricity grid systems.
- End-use efficiency: Promotion of state adoption of building codes. Expansion and tightening of product standards, potentially made tradable between manufacturers.Product standards on emissions will pull technologies into the marketplace by generating demand for them, and can complement a downstream cap-and-trade program by capturing emissions that would not be covered in a large-source system. Combining end-use standards with large-source emissions trading and funding for technology R&D can allow all sectors of the economy to play a role in reducing emissions in a cost-effective way.

Question 2. Allocation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Questions 2b:

Adaptation Assistance

- What portion of the overall allowance pool should be dedicated to adaptation research or adaptation-related activities?
- How should these allowances or funds be administered?
- What is the appropriate division between federal vs. regional, state, and local initiatives?

Pew Center Response

The Pew Center recommends a national adaptation strategy that would assess the range of needs and provide guidelines or standards for infrastructure planning, as well as reform existing policies that promote maladaptive behavior. In addition to the needs outlined in this strategy, funding should be provided for the development of early-warning systems for heat waves and other related threats, enhanced monitoring of infectious diseases, and evaluations of the implications of climate change for disaster management. Support should also be given for efforts at local, state, and regional levels, which is where much of the adaptation measures will be taken. Indeed, because we are already observing effects of climate change (sea-level rise, increased storm intensity, ecosystem impacts), the funding needs for adaptation will grow substantially over time – from funding research and planning to supporting on-the-ground changes in infrastructure and response.

Question 2. Allocation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Questions 2c:

Consumer Protections

- What portion of the overall allocation pool should be reserved to assist consumers?
- Should funds from the sale of permits or allowances be targeted primarily to low-income consumers, or should they be more widely distributed to benefit all consumers?

Pew Center Response

Initially, some portion of auction funds should be used for transition program for affected workers and communities, end-use efficiency investments, and otherwise addressing increased consumer costs as needed.

An earlier Pew Center report, *Worker Transition & Global Climate Change*,[7] indicated that for the average non-supervisory worker in a goods-producing sector (mining, construction, and manufacturing) who does not find a job until having completed two years of training, the total cost of a transition program would be about $106,000 per worker in 2010.

A separate report, *Community Adjustment to Climate Change Policy*,[8] concluded that that a new federal adjustment program for at-risk communities should be part of U.S. climate change policy. The report recommended that the U.S. government take the following actions:

- Designate and fund the Economic Development Administration (E.D.A.) of the U.S. Department of Commerce to design and implement an economic adjustment program for communities;
- Identify and assist communities that are particularly dependent on energy-producing and energy-intensive sectors before dislocations occur;
- Leverage and integrate additional resources by involving multiple federal agencies and state and local governments through federal and regional task forces; and
- Be flexible in addressing community needs by supporting locally determined, comprehensive strategies for five to seven years after the implementation of new climate policies.

While the amount of resources required for program implementation is difficult to determine, the authors suggested that an appropriate federal commitment might be $550 million ($50 million for planning, $500 million for implementation), and that resources be allocated so that a community has five to seven years to pursue adjustment.

[7] Barrett, J. 2001. *Worker Transition & Global Climate Change*. Arlington, VA: Pew Center on Global Climate Change
[8] Greenwald, J.; B. Roberts; A. Reamer. 2001. *Community Adjustment to Climate Change Policy*. Arlington, VA: Pew Center on Global Climate Change

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Note that, while transition programs are not formally part of the RGGI allocation process, the program does set aside 25% of the allowances for energy efficiency and strategic energy investments.

Question 2. Allocation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Questions 2d:

Set-Aside Programs

- What portion of the allocation pool should be reserved for the early reduction credit program and the offset pilot program?
- Are other set-aside programs needed?

Pew Center Response

The Pew Center believes early reduction credit and offsets need not be treated as set-aside programs, but rather as cost-containing flexibility mechanisms. Early reduction credit provides temporal flexibility, while offsets may provide geographic and sectoral flexibility to covered entities, and will be evaluated as part of the overall legislative package.

The Pew Center and nearly every company surveyed by the Center feel that credit or recognition should be given for GHG emission reductions achieved before the program becomes mandatory. The system should be designed so that the many companies that have voluntarily reduced their GHG emissions (as urged by the last three presidents) will not be implicitly penalized for doing so. Without such credit, companies that have taken early action could face higher costs for future emissions reductions than companies that did not pursue early voluntary reductions and thus have more "low hanging fruit" to harvest – therefore putting the early actors at a competitive disadvantage.

Credit should be provided not only to companies that registered their reductions under the U.S. Department of Energy's Voluntary Reporting of Greenhouse Gases Program (established under section 1605(b) of the Energy Policy Act of 1992), but also to those conforming to U.S. EPA Climate Leaders guidelines, the reporting protocol developed by the World Business Council on Sustainable Development and the World Resources Institute, the protocol developed by the World Economic Forum, and equivalent state and private registries, such as the California Climate Action Registry. The test should be whether the reductions were real and verifiable.

Note that the establishment of a "set-aside" program is by no means the only way to provide recognition of early action. Companies could be directly allocated allowances based on their registered emissions reduction. Some companies have suggested that covered emitters be allocated allowances as a function of their "baseline" emissions levels – the default baseline level being the amount emitted during a given year (or period of years). Emitters who could document beginning their emission reductions earlier than the default baseline year (or years) could move their baseline to that earlier period, leading to their being allocated a greater number of allowances. Such a program could either use set-aside credits or direct allowance allocation.

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Offsets are generally defined as out-of-system GHG reductions achieved by non-covered entities. Examples include greenhouse sequestration projects or verifiable credits from the programs of other countries with capped emissions. The use of offsets to meet allowance submission requirements should not be restricted, as long as the offsets reflect real, measurable, and verifiable reductions. In general, offset programs have significant benefits, because they provide flexibility in the geographic and sectoral location of emissions reductions. Inclusion of an offset program expands incentives for emissions reductions beyond those entities covered by the cap. These reductions opportunities will lower the overall cost of program compliance, and motivate a continuous search for low-cost, verifiable reduction opportunities.

Most companies note that offsets are a fundamental tool to efficiently lower the cost of emissions reductions both for firms and for the economy as a whole. They are also a critical market-based mechanism for directing investment to promising technologies and approaches for energy efficiency, low or no-carbon energy, low GHG manufacturing, and carbon sequestration. Offsets specifically expand the scope of the program and serve to unleash the power of the market to stimulate innovation and cost-effectively reduce emissions. One company notes that it will take decades to transition capital stock of power generating plants to low carbon sources, so there is a critical need for offsets as a way of cutting net emissions affordably in the short and medium term. Several companies note that the very function of a market-based system that allows offsets with firm rules regarding verifiability and liability for actual reductions will by its nature favor sources of offsets (all the way down to the specific project level) that are real and verifiable, and steer investment away from projects for which the expected reductions must be discounted due to risk factors (technical, commercial, political, etc.)

Regarding the special case of carbon sequestration, a broad "results-based" program — which provides rewards to project developers in proportion to the amount of additional carbon sequestered — has the potential to improve the cost-effectiveness of a national GHG mitigation program. A results-based program is also likely to result in more innovative solutions than "practice-based" approaches – approaches that give credit for certain practices without verifying the amount of carbon sequestered by each project. Nevertheless, some observers believe the government—in cooperation with researchers, landowners, and project developers—may be able to develop project-measurement and monitoring methods that are sufficiently accurate and reproducible to protect the environmental integrity of a large-scale program that allocates rewards on the basis of evaluations of individual projects.

The following would be needed to provide such integrity:

- A description of accepted practices for sampling and measuring carbon stocks at the project site;
- Methods to develop reference cases or baselines against which observed changes in carbon levels can be compared. Several different approaches to reference case development may be needed to accommodate the wide range of potential activities and settings.
- Methods to estimate or address the leakage effects, including permanence, geographical, and trade-offs among different GHGs;

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- Program methodologies designed to provide results that are reproducible by competent, independently-operating evaluators.

In general, offset programs have significant benefits, because they provide flexibility in the geographic and sectoral location of emissions reductions. Inclusion of an offset program expands incentives for emissions reductions beyond those entities covered by the cap. These reduction opportunities will lower the overall cost of program compliance, and motivate a continuous search for low-cost, verifiable reduction opportunities.

In order to verify emission reductions that are fungible with reductions made within the capped sectors, a robust system of measurement and verification is required. The Clean Development Mechanism in the Kyoto Protocol initially provided for a project-by-project review of proposed offsets that presents significant burden and uncertainty for entities seeking offsets. The Pew Center prefers the "standards" approach to offsets taken by the northeast Regional Greenhouse Gas Initiative (RGGI). RGGI's standards approach seeks to balance reduction verification with regulatory burden. Rather than reviewing projects one at a time, making judgments as to whether the project baseline is appropriate, whether project reductions are additional and real, etc., standards are set for a specific category of offsets, and project applications are assessed against that standard. This approach has two benefits: it makes program administration easier and project approvals more predictable, thus benefiting governments, environmental advocates and offset project developers by lowering the risk premium for such reductions. In the case of RGGI, the program is starting with the following offset categories: natural gas, heating oil, and propane efficiency; landfill gas capture and combustion; methane capture from animal operations; forestation of non-forested land; reductions of sulfur hexafluoride (SF_6) emissions from electricity transmission & distribution equipment; and reductions in fugitive emissions from natural gas transmission and distribution systems. RGGI expects to add project categories over time.[9]

The RGGI offset categories are not necessarily the right categories for a national program; they make sense for RGGI because RGGI only covered power plants. Offsets should be in source categories not covered by the cap-and-trade program; therefore, once the scope of the trading program is determined, one can evaluate which offsets are appropriate.

[9] Further information on offsets can be found in "Summary of RGGI Stakeholder Workshop on Greenhouse Gas Offsets", accessed at http://www.rggi.org/docs/offsets_workshopsummary.pdf.

Question 2. Allocation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Questions 2e:

Special considerations for fossil-fuel producers?

- Would some upstream fossil fuel producers be unable to pass the cost of purchasing permits or allowances through in fuel prices if they are the regulated entity?
- Is there a sufficient policy rationale for addressing these costs to justify the complexity of setting up and administering an allocation system for these entities?
- What other options exist to address the inability of fossil fuel producers to pass through these costs?

Please begin your response HERE. (no page limit)

Question 2. Allocation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Questions 2f:

Allocations for downstream electric generators?

- Should electricity generators be included in the allocation if they are not regulated? (Clarification: We mean to ask if an electric generator should be included in the allocation if the greenhouse gas regulation occurs at a point of regulation that is upstream or downstream from the generator, but not the generator itself.)
- What portion of the total allocation should be granted to the electric power sector? Should it be based on the industry's share of greenhouse gas emissions or some other factor?
- Should generators in competitive and cost-of-service markets be treated differently under an allocation scheme?
- How should permits or allowances be distributed within the electric sector? Should it be based on historic emissions? Electricity output? Heat input?

Pew Center Response

The Pew Center disagrees with the white paper's assertion that "All told, these costs would be offset completely by an allocation of roughly 5 to 10 percent of the total permit or allowance pool to fossil fuel producers," and would support a much larger free allocation, as described at the beginning of the response to Question 2.

The Pew Center supports allocating most allowances at the same point that regulation takes places in order to compensate those who are required to comply.

Power companies with a relatively low-carbon fuel mix prefer allocation based on electricity output. Power companies with a relatively high-carbon fuel mix prefer allocation based on historic emissions. Some manufacturing companies agree with the latter approach, based in part on their interests as large power users and depending on the carbon intensity of the generators supplying their electricity. Power companies in both camps indicate a willingness to consider compromise approaches depending on other aspects of a regulatory design package. They also generally agree that the most critical goal in reducing power sector GHG emissions in the medium and long term is to facilitate new plant investment in low-carbon and no-net-carbon technology, and many agree that the system should aim to phase out the highest-carbon plants in the generating fleet.

One utility notes that a compromise approach might involve beginning with a relatively input-focused allocation that transitions over a period of years toward a more output-based allocation. This sort of approach is one under consideration by a number of industry players. Another utility points out the importance of fairly reconciling differences between regions and economies dependent on coal and regions with abundant natural gas.

Question 2. Allocation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Questions 2g:

Allocations for energy-intensive industries?

- Is there a sufficient policy rationale to have an allocation to selected energy-intensive industries? What industries should be included in the allocation?
- What portion of the overall allocation framework should be reserved for these industries?
- What are the appropriate metrics for determining allocations across different industries?

Pew Center Response

Allocation as a policy vehicle can serve multiple purposes – reducing costs, motivating and compensating early action, addressing transition issues, etc. However, it will also likely be the most contentious element of the trading system development. Implementation may be made more straightforward by using a consistent rule for allocation across all sectors. On the other hand, sectoral tailoring may be necessary to address concerns about global competitiveness. Allowance allocation may be a particularly effective way of accounting for the relative price insensitivity of different sectors.

For vulnerable stationary sources that face intense competition that could lead to offshoring (and even higher GHG emissions), allowances can be provided to help ease the transition of capital stock to newer, more efficient technologies and cleaner fuels.

In transportation, while there is no clear consensus on how to reduce emissions from private vehicles, many observers believe that demand from U.S. private vehicle drivers is inelastic in the short term, i.e., that vehicle drivers will be willing to pay a very high price for gasoline without significantly modifying their travel behavior (with the exception of short term reaction to dramatic price spikes) or vehicle preferences. One serious negative effect of this price inelasticity is that if vehicle drivers are essentially included in a national cap-and-trade program — for example, by requiring allowance submission by the importers and refiners of petroleum products burned for transportation — they might bid the emissions allowance prices very high, to the detriment of the more price-sensitive manufacturing sector. As is the case with any potential damage to certain industries, allowance allocation might be a mechanism to make whole those requiring relief — and to do so in a way that changes over time to increase pressure for those industries to reduce emission at a pace they can afford.

Question 2. Allocation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Questions 2h:

Allocations to other industries/entities?

- What other industries/entities (e.g. agriculture, small businesses, etc.) should be considered in the allocation pool?
- What should be the basis for their share of the total allocation as well as for the distribution among such industries/entities?

Please see response to Question 2g.

Question 3. International Linkage
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Should a U.S. system be designed to eventually allow for trading with other greenhouse gas cap-and-trade systems being put in place around the world, such as the Canadian Large Final Emitter system or the European Union emissions trading system?

Clarifying Question 3a:

- Do the potential benefits of leaving the door open to linkage outweigh the potential difficulties?

Pew Center Response

Yes. The ability to link to other programs is critical in order to minimize mitigation and transaction costs, and to harmonize obligations under various systems. Companies whose obligations differ in the many nations in which they operate will have a much harder time complying with the requirements. For this reason it is crucial not only to link programs, but also to minimize the differences between relevant aspects of the programs as they are developed.

This position is corroborated by the extensive and ongoing discussions the Pew Center has had with member companies of the Business Environmental Leadership Council (BELC) and other domestic and international corporations about U.S. and international greenhouse gas (GHG) markets. Those that have expressed an opinion unanimously support designing U.S. cap and trade to allow for linkage to other national and regional trading systems. They cite several reasons.

- Most note that a well-functioning global trading market is perhaps the most critical mechanism for minimizing the long-term costs of GHG reductions for firms and society as a whole.
- Among cost-containment approaches, the linking of global GHG markets is among the least distortionary.
- Generally, larger trading volume and greater liquidity of GHG allowances will result in clearer, more stable prices. More stable prices will allow firms to project future prices more accurately and provide the certainty to plan and invest appropriately for the future (for example, in breakthrough technologies).
- Globalizing GHG markets supports the goal of encouraging all countries, including China and India, to participate in making real and verifiable reductions. (Companies note that offsets originating in large emitter developing countries will be among the lowest cost reductions and can be combined with export opportunities for U.S. firms.)

Note that the Northeast Regional Greenhouse Gas Initiative (RGGI) will accept EU and Clean Development Mechanism (CDM) allowances if certain price triggers are reached, but that under the Kyoto Protocol the EU can not accept RGGI allowances because the United States is

Question 3. International Linkage

Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

not a party to Kyoto. RGGI analyses indicate that international agreements that enable two-way linkages would be economically beneficial.

Question 3. International Linkage
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Question 3b:

- If linkage is desirable, what would be the process for deciding whether and how to link to systems in other countries?

Pew Center Response

In order to link a U.S. program with other systems, reductions would have to be considered real and verifiable by the respective systems. Deciding whether to link would involve evaluating the inventory, methodologies, monitoring protocols and compliance mechanisms of the other systems, and as well as the design of these programs to make sure that the environmental effect of a given reduction is roughly equivalent across the two programs. In addition, care should be taken to design a U.S. program that other countries will be interested in linking with. In particular, mechanisms that alter the environmental integrity of the program (e.g., a low safety valve) would make reductions in one program not necessarily equivalent to reductions in another, jeopardizing the ability to link the two.

Federal legislation will need to address the state and regional GHG cap-and-trade programs now under development, some of which may be linked to each other and to other countries. As with any area of federal policy in which the states have taken the lead, Congress will have to decide on the extent to which the federal program will defer to pre-existing state programs, for example, governing allowance allocation.

Question 3. International Linkage
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Question 3c:

- What sort of institutions or coordination would be required between linked systems?

Pew Center Response

Because the validity and verifiability of reductions is critical for trading, measuring, monitoring, and compliance mechanisms would need to be comparable. While this may or may not require a central overseeing body, a shared platform on which to carry out the trades – such as an agreement to use a common monotoring and reporting protocol – would be required.

While elements within each country differ, Kyoto signatory countries, including the EU, Canada and Japan, have trading systems that are inherently linked by means of the treaty requirements. Requirements stipulate that each country needs to develop a consistent national system for estimating emissions and removals of GHGs by their common definition of trading units – Assigned Annual Units (AAUs), Joint Implementation (JI) credits and Clean Development Mechanism (CDM) credits – and by the requirement that an international transaction log (ITL) be established. This shared platform will enable the tracking and the issuance of credits, cancellation, retirement and carry-over to the commitment periods following 2012. In essence, Kyoto parties are linked because they share common definitions, common requirements and a common platform for trading.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

If a key element of the proposed U.S. system is to "encourage comparable action by other nations that are major trading partners and key contributors to global emissions," should the design concepts in the NCEP plan (i.e., to take some action and then make further steps contingent on a review of what these other nations do) be part of a mandatory market-based program? If so, how?

Pew Center Response

It is important to distinguish between two distinct but related policy objectives: 1) achieving adequate action by all major emitting countries, and 2) protecting U.S. firms against competitiveness impacts. Each requires a different set of policy approaches.

Ensuring that other countries act against climate change is important from a competitiveness standpoint. However, it is first and foremost an environmental imperative: without adequate action by all major emitters, the goal of climate protection cannot be met. Of steps the United States can take to encourage other nations to act, establishing a mandatory program to limit and reduce U.S. emissions may in and of itself be the most critical. Lack of action by the United States stands as the major impediment to stronger efforts by other countries. Demonstrating the will – and establishing the means – to reduce U.S. emissions will greatly alter the international political dynamic and improve prospects for international cooperation.

Making future U.S. action expressly contingent on the efforts of other countries may provide some further inducement for action. Alternatively, by appearing irresolute, it may deter others from commencing ambitious long-term efforts. A more effective means of achieving adequate and comparable effort by all major emitters would be the establishment of mutual commitments through multilateral negotiation and agreements. In the case of developing countries, this should include or be complemented by positive incentives, preferably through market mechanisms.

Ensuring that efforts are broadly comparable, however, will not necessarily achieve the second objective: protecting against competitiveness impacts. It is not the competitiveness of the U.S. economy as a whole that is at issue. Competitiveness at the national scale is largely a reflection of productivity, and the U.S. economy consistently ranks among the world's most competitive.[1] The cost of achieving mandatory GHG limits at the levels under consideration

[1] The United States ranked second only to Finland in the World Economic Forum's 2005-2006 Global Competitiveness Report. (World Economic Forum, *Global Competitiveness Report 2005-2006*. Available: http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5CGlobal+Competitiveness+Report)

would only marginally affect projected economic growth and is unlikely to affect overall competitiveness.[2]

To the degree there are competitiveness impacts, they would fall on specific sectors – energy-intensive industries whose goods are traded internationally, a relatively small segment of the U.S. economy.[3] However, these sectors could remain vulnerable even if efforts by all major emitters are broadly comparable because countries will choose to allocate effort differently.[4] For instance, a country may reduce overall emissions but exempt a given sector from controls, giving that sector an advantage over foreign competitors that are subject to controls. In that case, a review of comparability, unless undertaken sector by sector, offers little assurance against competitiveness impacts.

A full assessment of policy options for addressing competitiveness would require a more thorough analysis of the potential impacts on vulnerable sectors than is presently available. Generally, the impacts on a given sector or firm would depend on its specific competitive positioning and its ability to substitute and innovate. Most analyses of U.S. industry experience with past environmental regulation find little evidence of competitive harm. One comprehensive review – synthesizing dozens of studies across a range of U.S. regulations and sectors – concluded that while environmental standards may impose significant costs on regulated industries, they do not appreciably affect patterns of trade.[5] Some economic literature suggests that, to the contrary, innovation spurred by regulation may in fact confer a competitive advantage.[6]

In the design of a cap-and-trade system, the best way to protect broadly against competitiveness impacts is to set the caps at modest levels and minimize compliance costs by, for instance, allowing offsets and full banking of allowances. The choice of allocation approach also has implications. A free "grandfathering" of allowances based on historic emissions provides

[2] EIA projects that achieving the emission targets of the Climate Stewardship Act would diminish U.S. GDP by 0.4 percent in 2028, thus total GDP is projected to be 89.6 percent higher rather than 90 percent higher than GDP in 2006. (EIA, *Analysis of Senate Amendment 2028, the Climate Stewardship Act of 2003*. May 2004. Available: http://www.eia.doe.gov/oiaf/analysispaper/sacsa/pdf/s139amend_analysis.pdf)

[3] Repetto et al. found in a 1997 analysis that, among all U.S. industries producing tradeable goods and services, roughly 90 percent of output and employment was in industries with energy costs representing 3 percent or less of output value. (Repetto, R., C. Maurer and G.C. Bird. "U.S. Competitiveness is Not at Risk in the Climate Negotiations." *WRI Issue Brief*, October 1997.)

[4] The Carbon Trust recently suggested that differences between National Allocation Plans within the EU Emissions Trading system has significant implications on sectoral competitiveness even though country efforts under the overall system are widely viewed as compatible (Carbon Trust, "The European Emissions Trading Scheme: Implications for Industrial Competitiveness." June, 2004. See also IISD, "Climate Change and Competitiveness: A Survey of the Issues," March 2005; and European Commission, "International Trade and Competitiveness Effects," Emissions Trading Policy Brief No. 6, 2003.)

[5] Jaffe,A.B., S.R. Peterson,P.R. Portney, and R.N. Stavins. "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?" *Journal of Economic Literature*. Vol. XXXIII, March 1995.

[6] Porter, M. "America's Green Strategy," *Scientific American,* 264, 4: 96, 1991; Porter, M. and C. van der Linde, "Toward a New Conception of the Environment-Competitiveness Relationship," *Journal of Economic Perspectives* 9, 4:97-118, 1995.

inherent protection for potentially vulnerable firms by conferring assets whose sale can offset losses.

One option to mitigate potential competitiveness impacts is to provide supplemental allowances to sectors deemed to be vulnerable. Another is to dedicate funds — possibly by auctioning a portion of allowances — to assist vulnerable sectors. Assistance could include:

- Incentives for the deployment of cleaner or more efficient technologies, such as accelerated depreciation of existing stock, or tax credits for the deployment of specific technologies or the production of less emissions-intensive products.
- Support for research and development of long-term technology.
- Transition assistance for workers in sectors likely to experience job losses.

Further steps to address competitiveness would require some mechanism to identify vulnerable sectors based on an analysis of export patterns among energy-intensive industries and relative energy pricing in competing countries.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change
Clarifying Question 4a:

- What metrics are most valuable for comparison of developed and developing country mitigation efforts to U.S. efforts?

Pew Center Response

Apart from its limited value in addressing competitiveness, a periodic review of other countries' overall climate efforts would pose serious methodological challenges. No metric is straightforward and all rely at least in part on qualitative assessment or assumptions. Comparing government expenditures is difficult because not all governments tally their climate-related spending and, among those that do, each does it differently. A 2004 GAO report showed, for example, that even in the United States it is difficult to track climate-related expenditures over time.[7] Adoption and implementation of policies that directly or indirectly reduce emissions is another measure of effort, but only a qualitative one, unless the policies' emissions impacts can be reliably quantified.

Even with reliable emissions data, however, any comparison hinges heavily on the chosen indicator. If the measure is emissions intensity, a country like China can show tremendous improvement (a 47% reduction from 1990 to 2000) even as its absolute emissions soar.[8] In per capita terms, India's emissions are projected to rise 50% by 2025, nearly twice the world average, yet will still be just one-fourteenth those of the United States.[9] The measure of "effort" that translates most directly into "result" is absolute emissions. However, among the major emitters, the absolute emission increases projected for 2025 vary tremendously – from roughly 10 percent in the European Union to 130 percent in China.[10] Any reasonable comparison must take into account wide disparities in natural endowment, economic structure, stage of development, and other national circumstances. While such analysis can and should inform the policy process, any determination of "comparability" is ultimately subjective.

If periodic Congressional review is to be mandated, it should also take into account new scientific and technological developments and other factors bearing on the feasibility, cost, and urgency of emissions reduction.

[7] While reported federal spending rose from $3.3 billion in 1993 to $5.1 billion in 2004, the GAO found, the government's accounting had changed considerably over that period as successive administrations added programs not previously counted as climate-related. (US GAO, "Climate Change: Federal Reports on Climate Change Funding Should be Clearer and More Complete." GAO-05-461, August 2005.)

[8] Baumert, K. and J.Pershing, with T. Herzog and M. Markoff. "Climate Data: Insights and Observations." Prepared for the Pew Center on Global Climate Change, November 2004.

[9] EIA. *2005 International Energy Outlook.* DOE/EIA-0484, July 2005.

[10] EIA. *2005 International Energy Outlook.* DOE/EIA-0484, July 2005.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Question 4b:

- What process should be used to evaluate the efforts of other nations and how frequently should such an evaluation take place?

Please begin your response HERE. (no page limit)

Question 4. Developing Country Participation
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Clarifying Question 4c:

- Are there additional incentives that can be adopted to encourage developing country emission reductions?

Please begin your response HERE. (no page limit)

Pew Center Response

Three strategies can provide additional incentive to developing countries to reduce emissions: direct bilateral assistance; multilateral agreements that recognize developing country actions; and market-based incentives through a domestic and/or an international emissions trading system

Bilateral assistance – Direct U.S. support for developing country efforts should be expanded, better targeted, and tailored to the needs of developing countries. The highest priority for most developing countries is economic growth and development. Rather than viewing climate-friendly technology deployment solely as an exercise in increasing exports or funding demonstration projects, our objective should be to integrate climate-friendly activities into national strategies for economic growth, poverty reduction, and sustainable development. For instance, energy policies and plans are critical to achieving economic and development objectives. U.S. assistance should help developing countries build their capacity to assess clean energy options and establish policy frameworks that will favor such options even after our funding assistance is gone.

U.S. assistance also should support and promote efforts by the largest developing countries to identify specific goals for limiting their emissions of greenhouse gases – recognizing that their goals may vary in form, content and timing. One way to do that would be to require that the largest developing countries, in agreeing to receive bilateral assistance, establish goals consistent with their development strategies, and periodically report progress towards meeting them.

Developing country commitments – Achieving broad participation in a strengthened multilateral effort will require a more flexible framework allowing different countries to take on different types of commitments best suited to their national circumstances. In the case of developing countries, this could mean allowing for non-target approaches such as policy commitments in which governments commit to undertake national policies that will advance core economic and development priorities, such as energy access or security, while contributing to climate mitigation. These could include energy efficiency standards, renewable energy targets,

technology standards phasing in advanced electrical generation technologies, or policies to preserve forests and promote sequestration practices.[11]

A multilateral framework allowing such commitments would provide international recognition of developing country efforts and, thereby, an incentive for strengthening these efforts.

Market incentives – An important driver for developing country efforts to reduce emissions is access to emissions trading markets. The Clean Development Mechanism (CDM) established under the Kyoto Protocol enables developing countries to market certified emission reduction credits resulting from projects that reduce emissions below business as usual. Despite a slow startup, the CDM is now operational, with nearly 150 projects approved and several hundred more in the pipeline.

As presently structured, however, the CDM allows crediting only of discrete projects, limiting its potential reach. Kyoto parties agreed recently to open consideration of a more "programmatic" approach that could potentially allow crediting of reductions resulting from a much broader range of activities. One possibility would be crediting of reductions across an entire sector driven by policies such as energy efficiency standards (reductions would have to be quantified and verified). Such an approach could complement the type of policy commitments described above, providing a powerful market incentive for developing countries to enact and faithfully implement such policies.[12]

A programmatic crediting mechanism of this type could be established as an adjunct to a domestic emissions trading system or as a feature of a future multilateral approach.

[11] Pew Center on Global Climate Change. "International Climate Efforts Beyond 2012: Report of the Climate Dialogue at Pocantico." November 15, 2005.

[12] Pew Center on Global Climate Change. "International Climate Efforts Beyond 2012: Report of the Climate Dialogue at Pocantico." November 15, 2005; Figueres, C. "Draft Proposal for the Implementation of Programmatic CDM Project Activities within the Existing Regulatory Framework of CDM Project Activities." Prepared for the Carbon Finance Business Unit of the World Bank, November 29, 2005. Available: http://carbonfinance.org/docs/Programmatic_CDM_Implementation_Paper.pdf.

World Resources Institute

Submitter's Name/Affiliation: **Jonathan Pershing, World Resources Institute**
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EXECUTIVE SUMMARY

The World Resources Institute (WRI) is submitting responses to Questions 1, 2, 3(a)(b)(c), and 4(a)(b)(c).

To mitigate the risk of dangerous climate change and avoid the worst physical and economic impacts, scientific evidence suggests that policies are needed to drive significant near-term reductions in emissions and achieve long-term stabilization of atmospheric greenhouse gas (GHG) concentrations. For the U.S., this challenge implies that economy-wide emissions will need to peak and begin declining on an absolute basis within the next 10 years. In light of the urgency and stringency required in a U.S. program to address climate change, a mandatory market-based system for GHG regulation is a vital option that could serve to reign in emissions quickly and at least cost. While there are additional policy options that are complementary and deserve consideration, market-based systems have proven to be powerful tools and are a key means to making cost-effective emission reductions.

Experience with mandatory market-based systems for GHG emissions implies that political considerations have as much to do with program design as technical or efficiency-based considerations. In all existing or proposed GHG emission trading systems, upstream regulation has been eschewed in favor of downstream regulation. One important reason for this is that an upstream system is effectively a carbon tax for which the value will be variable and unknown in advance. Another is to establish a relatively simple system first rather than cover every economic sector, with all that entails in terms of complexity and interest groups. Downstream systems tend to start with narrow coverage and an explicit aim to become more inclusive over time.

Distribution of allowances too is predominantly political. Auctioning as opposed to free allocation presents considerable practical and theoretical strengths, but in general these have not been sufficient to overcome industry opposition to auctioning. As greater experience is gained with market-based systems, however, the appeal of an auction is increasing. If a free allocation is pursued, several inter-related design variables must be considered simultaneously.

Linking emission trading systems is desirable where possible but can be done successfully only where a number of conditions are satisfied, especially mutual confidence. This makes linking plausible with the European Union and Canada but not with countries such as China and India for the foreseeable future. No overseeing structure is needed to link trading systems.

There is no single metric for evaluating relative efforts of different countries, though there is a range of metrics that can throw light on the subject. The appropriate consideration is whether international partners are taking *appropriate* levels of action rather than *equal* levels. Making U.S. policy formally contingent on specific actions in other nations would be counter-productive, but formal or informal review of relative efforts is a normal part of international negotiations.

Question 1. Point of Regulation
Submitter's Name/Affiliation: Jonathan Pershing, World Resources Institute

Who is regulated and where?

This section presents a rationale for the following points:

1. Existing experience with mandatory market-based systems for greenhouse gas (GHG) emissions implies that political considerations have as much to do with program design as technical- or efficiency-based considerations.

2. While upstream coverage offers potential advantages in terms of efficiency, in practice its similarity to a carbon tax has prevented its use among existing market-based systems. An upstream system raises prices for every fossil fuel user indiscriminately. In effect, the upstream approach is a carbon tax for which the value will be variable and unknown in advance. While there are sound reasons for implementing an upstream point of regulation (or a carbon tax, for that matter), the political sensitivities are critical to implementation.

3. To date, all existing or planned systems have rejected the upstream point of regulation in favor of a system that is downstream, modest in its initial coverage, and with plans to expand over time. Also, a downstream approach places direct responsibility for monitoring, reporting and trading emissions in the hands of those best-placed to reduce emissions. The downstream approach is favored among existing systems for several reasons, including the desire for simplicity at the outset, and thus for narrow coverage of sectors and gases. Sectoral coverage is notably similar between systems around the world and centers on the power sector and (in most cases) heavy industry.

4. Existing downstream systems have an explicit aim to become more inclusive over time. This is likely based on two factors: (1) recognition that narrow coverage is inadequate to addressing the magnitude of the problem, and (2) additional sectors and gases in a market-based system increase the opportunities to reduce emissions and therefore are likely to decrease the overall costs. Greenhouse gas emission trading systems have also tended to be implemented as one component of a broader set of policies and measures to reduce emissions in other sectors.

To evaluate the options for point of regulation in a mandatory market-based system, it is important to consider the magnitude and timing of the reductions that are required in greenhouse gas (GHG) emissions. To mitigate the risk of dangerous climate change and avoid the worst physical and economic impacts, policies are needed to drive significant near-term reductions in emissions on an absolute basis and achieve long-term stabilization of atmospheric GHG concentrations.[1] For the U.S., this challenge implies that economy-wide emissions will need to peak and begin declining on an absolute basis within the next 10 years.[2] In addition, the U.S. will need to use its economic strength and technological capabilities to develop and export clean energy technologies globally.

In light of the urgency and stringency required in a U.S. program to address climate change, a mandatory market-based system for GHG regulation is a vital option that could serve to reign

in emissions quickly and at least cost. In this regard, the white paper issued in February 2006 by Senators Domenici and Bingaman identifies the issues of fairness and administrative simplicity in relation to the pros and cons of economy-wide versus sector-specific approaches to regulating GHG emissions, including the debate over "upstream" versus "downstream" regulation. Taking into consideration the formidable challenge of making deep reductions in U.S. emissions, an economy-wide approach is not only preferred but ultimately almost certainly required.

This is not to say, however, that a single market-based emissions trading system must achieve economy-wide coverage by itself. To the contrary, given that all policy options must be "on the table" to deal with climate change, the salient question is not about market-based systems *per se* but rather the role that market-based systems should play in a suite of federal policies designed to reduce emissions. The full suite of policies may include fiscal measures, regulatory instruments, voluntary agreements, and research, development and deployment (RD&D)[3].

As shown in Figure 1,[4] the variety and complexity of GHG emissions across the U.S. economy suggests that an approach based on multiple policy tools may be attractive or even necessary. The overwhelming share (87 percent) of U.S. emissions comes from the combustion and processing of fossil fuels. Over 60 percent of U.S. emissions come from two sectors, transportation and electricity and heat. The middle portion of Figure 1 divides emissions according to use or activity, tracking the "downstream" points in the emissions life-cycle. The right side of Figure 1 divides emissions by gas. Carbon dioxide (CO2) accounts for 85 percent of U.S. GHG emissions.

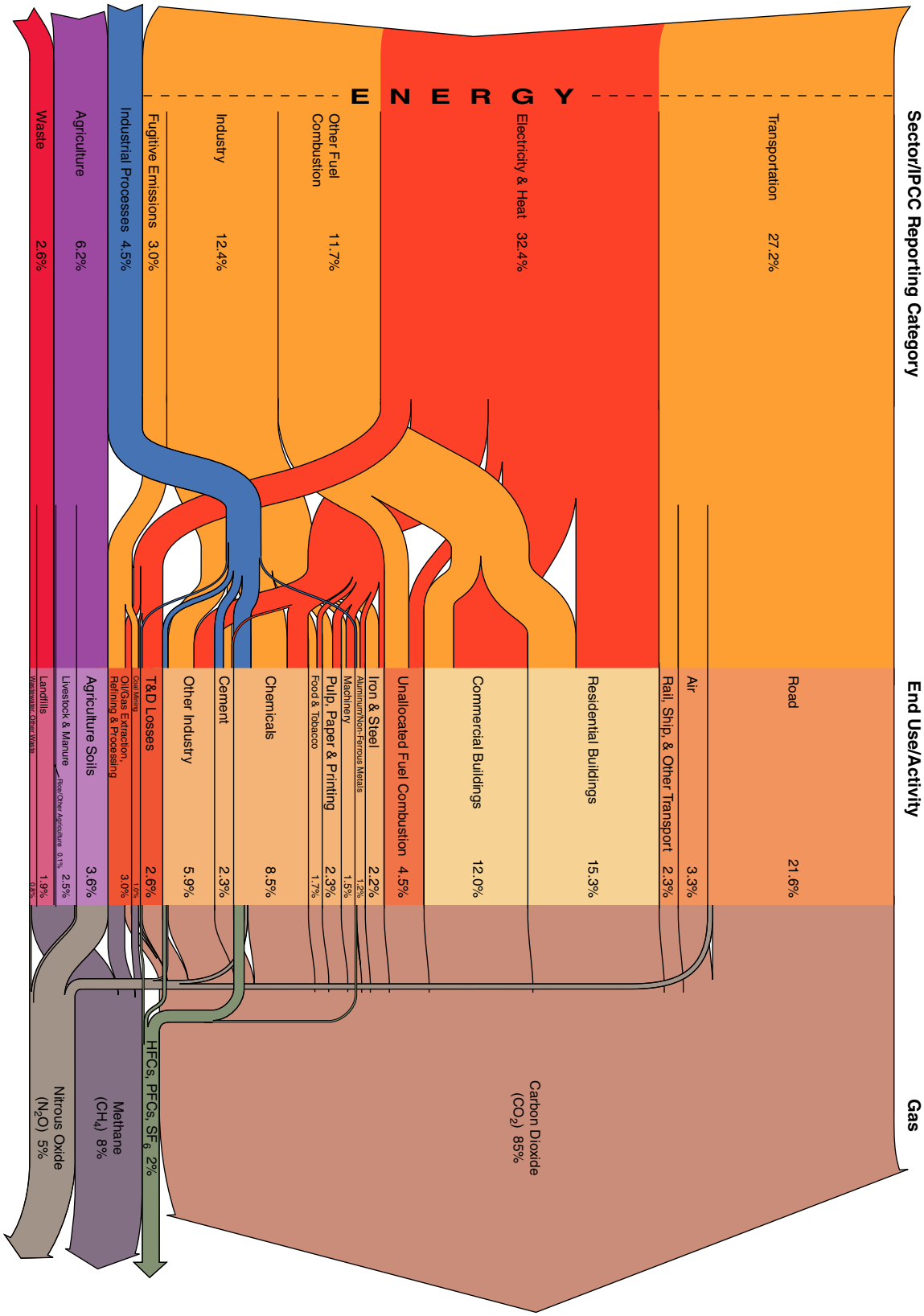
Given the prevalence of CO2 from energy consumption, a number of economists and firms, including Duke Energy Corporation, argue that the centerpiece of a U.S. response to climate change should be a revenue-neutral "carbon tax shift" by which existing distortionary taxes are reduced and the revenue to the Treasury is replaced by a consumption tax on all carbon-based fossil fuels – coal, oil and natural gas.[5] Importantly, however, tax policies are not mutually exclusive to a market-based system; the two could be complementary.[6]

If Congress seeks to make a mandatory market-based system as far-reaching as possible and construct an economy-wide approach, then the upstream point of regulation (dealing with coal, oil and natural gas producers and suppliers) is the clear choice. A pure upstream system has never been implemented, but the theoretical advantages include:

- A price signal that would be recognized in every economic sector, which in turn could drive the most emissions reductions at the least cost.
- Avoidance of sector-specific rules and associated administrative requirements.
- Coverage of sectors that are difficult to address in a downstream system, especially transportation.

Question 1. Point of Regulation
Submitter's Name/Affiliation: Jonathan Pershing, World Resources Institute

Figure 1: U.S. Greenhouse Gas Emissions Flow Chart



Sources & Notes: Created by World Resources Institute using data from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2003,* U.S. EPA (using the CRF document). Allocations from "Electricity & Heat" and "Industry" to end uses are WRI estimates based on energy use data from the International Energy Agency (IEA, 2005). All data is for 2003. All calculations are based on CO_2 equivalents, using 100-year global warming potentials from the IPCC (1996), based on total U.S. emissions of 6,978 $MtCO_2$ equivalent. Emissions from fuels in international bunkers are included under Transportation. Emissions from solvents are included under Industrial Processes. Emissions and sinks from land use change and forestry (LUCF), which account for a sink of 821.6 $MtCO_2$ equivalent, and flows less than 0.1 percent of total emissions are not shown. For detailed descriptions of sector and end use/activity definitions, see *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy* (WRI, 2005).

An upstream system means that most operators in the economy, whether companies or individuals, do not directly participate in trading. Rather, most "downstream" entities are affected by the system through increases in energy prices, as the cost of allowances is passed through to them by energy producers and suppliers. Since fuel suppliers themselves do not have direct control over most emission abatement options (a coal supplier cannot switch fuels, improve end use efficiency, etc.), the real actors in emission abatement are given a price signal. In this respect, an upstream system closely resembles a carbon tax for much of the economy.

In comparison, a downstream market-based system places emission monitoring, reporting and trading squarely in the hands of the people who are closest to the decisions on cutting emissions (e.g., plant operators). This approach is widely familiar in the U.S. and elsewhere and has been used for both sulfur dioxide (SO2) and nitrogen oxide (NOx) emissions trading, with notable success. However, a downstream system would not capture some sectors, most notably transport, which accounted for 27 percent of U.S. GHG emissions in 2003, and would therefore have to be part of a broader set of climate policies to address the problem adequately. Downstream application may allow for better coordination of a market-based system with other existing or planned regulations and policies affecting GHGs.

To better understand the implications of using upstream versus downstream regulation, the experience of other GHG emissions trading systems is instructive. In the following section we present four general observations of existing systems.

General observations from other GHG systems:

1. All downstream

It is striking that all examples of existing or past emissions trading systems for GHGs apply downstream, and the same is true for the advanced proposals for the Regional Greenhouse Gas Initiative (RGGI) in the northeast U.S. as well as the Canadian Large Final Emitter System (LFE). The primary reasons for this seem to be those outlined above: alignment of incentives with actors and a belief that sectors such as transport are best addressed by other measures.

In the case of the European Union Emissions Trading System (EU ETS) for instance, consultants to the EU tended to advocate an upstream system based on economic efficiency considerations. The EU chose a downstream application for three reasons – one economic, and two political:

- On the economic front, it was felt that downstream application would give greater incentive to plant managers to deal with emissions creatively than a simple energy price increase through an upstream system.
- As noted above, an upstream system is fiscally equivalent to a carbon tax, and could have been presented as a fiscal measure. In the EU, fiscal legislation needs to be approved unanimously by the member states, while environmental legislation can be passed with a majority vote. Placing the application downstream to industrial installations kept the proposal in the realm of environmental policy.

- In the EU, transport fuels are already heavily taxed, and in 2000 surging fuel prices had caused concern in European countries. Since an upstream emission trading system applies an effective fuel tax at a level not known in advance, this was regarded as too politically risky.

The Canadian LFE program and the RGGI among seven northeastern U.S. states both plan to adopt similar approaches. In each case, simplicity and the desire to move forward incrementally informed this choice. The Canadian LFE program seeks to regulate downstream emission sources within the Canadian economy. It was not designed to regulate GHGs upstream due to the political perception that emissions should be cut by end users and not by energy and feedstock producers. This perception was reinforced by the strong objection of oil and gas companies (a large part of Canada's economy) to any upstream GHG regulation.

RGGI state negotiators also focused the point of regulation downstream, specifically on electricity generators. Downstream regulation was familiar to RGGI states since they had experience with market-based systems to control conventional pollutants, including the U.S. Acid Rain Program, the Ozone Transport Commission (OTC) NOx Budget Trading Program and the NOx State Implementation Plan (SIP) Call program.

2. Sectoral coverage and the value of simplicity

In terms of sectoral coverage, there is considerable similarity between the systems – all focus on large point sources of emissions. In each case the aim was to keep the system as simple and manageable as possible in the early stages.

For example, the European Commission's primary concern was to limit the complexity of the EU ETS in its early stages. The Commission therefore focused on heavy industry sectors that covered the largest amount of emissions from a limited number of installations. Sector coverage includes power generation, cement, lime, iron and steel, ceramics, paper and pulp, and glass manufacture. Together, these sectors account for roughly 50 percent of EU CO2 emissions, from around 12,000 installations. At present, it covers only CO2 emissions, but it aspires to cover other sectors and gases through expansions over time. The inclusion of power generation means that, in effect, many other sectors are affected by the system. For instance, the majority of emissions associated with aluminum and many chemical processes derive from their use of electricity. The most controversial omission was the chemical sector. The Commission argued that the sector accounted for only 1 percent of EU direct CO2 emissions but some 30,000 installations, and excluded it from initial trading phases on the grounds of simplicity. In practice, large chemical installations tend to be covered as they have large on-site boilers or generators that are regulated.

There was considerable enthusiasm among industry participants for the inclusion of non-CO2 gases such as sulfur hexafluoride and nitrous oxide. The EU's legislation emphasizes that their inclusion is desirable but excludes them from the early phases because of concerns about the accuracy of monitoring in many applications. Because of the high global warming potentials of

non-CO2 gases, inaccuracy in monitoring can be as much as 20,000 times more consequential, pound for pound, than in the case of CO2.

Canada's LFE proposes to cover more or less the same sectors as those in the EU system, with some additions (chemicals, aluminum) and exceptions (cogeneration). The LFE System includes the largest emitting sectors in Canada's economy totaling nearly 50% of total GHG emissions. Covered industries included in each sector were selected through a threshold approach where an industry must meet both of the following criteria: (1) annual average emissions of 8 kilotonnes CO2 equivalent per establishment or more; and (2) annual average emissions of 20 kilograms CO2 equivalent per $1000 gross production or more.

Because this threshold approach applies to each industry, not each specific source, smaller sources within GHG-intensive industries will be included in the LFE program. For instance, because the cement industry is included in the LFE program, all cement sources (including smaller cement sources) will also be covered. This approach was designed for equity reasons to minimize competitive disadvantages due to the LFE program. Similarly, even if a specific industry has several large emitting sources, if that sector as a whole falls below the threshold, these large sources will not be covered in the LFE program. This is the case for the automaking industry, which does not qualify as a large emitting sector.

RGGI is designed to cap and reduce CO2 emissions from the electricity generation sector. In designing the program, a primary goal was to keep the initial program simple and attainable. To this end RGGI only regulates CO2 emissions from electricity generators with a nameplate capacity of at least 25 MW. There were two reasons for this. First, approximately 85% of electric power generating units in the region are equipped with continuous emissions monitors (CEMs) that report CO2 emission data to the EPA through the Acid Rain Program. Thus, the monitoring infrastructure was already in place, whereas most industrial sources are not equipped with CEMs. Second, the number of electric generation units (700 region-wide) is manageable and accounts for nearly 20% of the region's total emissions. Adding industrial sources would have added monitoring complication while covering at most an additional 8.8% of regional emissions.[7]

The inclusion of electricity generating units with a nameplate capacity as low as 15 MW was considered but was rejected as most smaller units are not equipped with CEMs and would have covered a small amount of additional CO2 sources. The transportation sector, the largest source (35.4%) of regional emissions, was left out of RGGI and is instead being addressed through adoption of GHG vehicle emissions standards being developed by California.

3. Expansion to other sectors

While all the systems examined here have initially tried to limit sectoral coverage, all have been explicit in stating the intention to gradually expand this scope.

The EU ETS allows individual countries to "opt-in" other sectors, subject to certain criteria. It also explicitly promises in subsequent commitment periods to expand the system. Proposals

currently being examined include CO2 emissions from aviation and non-CO_2 gases in industry applications. In addition it allows access to the Kyoto project mechanisms: Joint Implementation and the Clean Development Mechanism. These allow projects in developing countries that can cover six GHGs and all emitting sectors, as well as afforestation and reforestation projects.

RGGI plans to start with one sector and one gas, but lays clear its interest in expanding the system to other sectors and gases over time, if possible. RGGI does affect other gases and sectors at the outset through an offsets program, including agriculture, natural gas distribution, and energy end-use in commercial/residential sectors. Furthermore, RGGI may add additional offset categories over time.

In both cases of the EU ETS and RGGI, the desire to expand appears to be rooted in two factors: (1) recognition that the limited scope of coverage at the outset is inadequate to addressing the magnitude of the problem, and (2) additional sectors and gases in a market-based system increase the opportunities to reduce emissions and therefore are likely to decrease the overall costs.

4. Treatment of electricity

There is a notable similarity in approach between existing ETS systems in terms of the preference for downstream application, the sectoral coverage, and the tendency to start simple rather than all-inclusive. However, one crucial and interesting way in which they differ is in their treatment of electricity. As the power sector is invariably the largest sector in these systems, this is important.

In the EU ETS, Canada's LFE system and RGGI, electricity generators are formally covered by the system (i.e. the generators have targets and surrender allowances). This could be characterized as a "midstream" approach. However, the United Kingdom ETS took a radically different approach that excluded power companies themselves from the trading system by covering electricity-related emissions further downstream.

The UK pioneered a downstream carbon trading system at a national level, but did so in an environment of specific political constraints. These shaped in particular the way that electricity was treated. The UK's power sector was not formally covered, i.e. power generators were not responsible for limiting their emissions or for holding or trading allowances. Rather, industrial (but not residential or commercial) consumers of electricity were responsible for the emissions associated with their electricity supply. This was calculated on the basis of a standard national emission factor per kilowatt-hour of electricity.

The effect of this was that electricity users had an increased incentive to reduce their consumption but the incentive for power companies to switch fuels was removed. The reasons for this were twofold:

- "Fuel poverty" – concerns over the impact of energy prices on the poor – was a major political issue at the time, and this approach prevented price impacts on residential consumers.

- The UK had seen dramatic switch from coal to gas for two decades, and the dramatic shrinking of its coal industry. The government did not want to exacerbate that effect.

Implications for a U.S. federal system

In brief, existing experience with mandatory market-based systems implies that political considerations have as much to do with program design than technical- or efficiency-based considerations. In particular, all existing or planned systems have rejected the upstream point of regulation in favor of a system that is downstream and modest in its initial coverage, but with plans to expand over time.

[1] See, e.g., O'Neill, B. C., and M. Oppenheimer. 2002. Climate Change—Dangerous Climate Impacts and the Kyoto Protocol. *Science* 296(5575): 1971–72. Hasselmann, K. et al. 2003. The Challenge of Long-term Climate Change. *Science* 302: 1923-1925.

[2] This figure is derived from a WRI estimate built on modeling analyses and assumptions in: den Elzen, M.G.J. and M. Meinshausen. 2005. Meeting the EU 2°C climate target: global and regional emissions implications. Bilthoven, The Netherlands: Netherlands Environmental Assessment Agency. Key assumptions include: (1) 550 PPM global stabilization (for all gases); (2) developing country emissions continue to rise beyond 2050; (3) continued globalization with dependence on fossil fuels, but optimistic assumptions on technology for GHG abatement potential and costs (more optimistic than a medium-level emissions scenario by IPCC SRES); and (4) "multi-stage" policy adoption involving gradual increase in binding targets for industrialized countries and 3 stages of policy adoption by developing countries (no commitment, then intensity targets, then absolute).

[3] For example, in an effort to achieve the necessary economy-wide emissions reductions, a U.S. response could include: a cap-and-trade program for large downstream emitters; an aggressive RD&D "Manhattan project" for clean energy technologies; negotiated voluntary agreements with key commercial sectors; improved automobile efficiency standards, improved urban planning and a gasoline tax to reduce emissions in the transportation sector; changes in trade agreements to improve the import and export of clean energy fuels and technologies; and strengthening of international agreements on climate change.

[4] Figure 1 provides a comprehensive overview of U.S. GHG emissions, their composition, and the sectors and activities from which they derive. The left side of the figure shows emissions by *sector*, using definitions from the IPCC. IPCC sectors are analogous to those commonly used by the U.S. Energy Information Administration and Environmental Protection Agency (residential, commercial, industrial and transportation), but there are important differences. Heat under the "Electricity and Heat" sector refers to heat plants that generate heat distributed for use by other sectors as opposed to heat generated on-site to heat buildings or for manufacturing. In the U.S., the heat generation component accounts for less than 5 percent of the sector total. Industrial emissions are separated into combustion-related emissions (under Energy) and process emissions. The latter refer to emissions from the manufacturing processes of various materials, as opposed to the energy used to produce those materials. For example, in the cement industry, carbon dioxide emissions result both from chemical reactions arising from clinker production and energy use at several stages in the production process.

[5] Parry, I. 2003. Fiscal Interactions and the Case for Carbon Taxes over Grandfathered Carbon Permits, Resources for the Future Discussion Paper 03-46. Washington, DC: Resources for the Future; Dinan, T.D., and R. Shackleton. 2005. Limiting Carbon Dioxide Emissions: Prices vs Caps. Washington, DC: Congressional Budget Office; Repetto, R. et al. 1992. *Green Fees: How a Tax Shift Can Work for the Environment and the Economy.* Washington, DC: World Resources Institute; Poterba, James M. 1991. Tax Policy to Combat Global Warming: on Designing a Carbon Tax, in Dornbusch, R., and J.M. Poterba, eds. 1991. *Global Warming: Economic Policy Responses.* Cambridge, MA: Massachusetts Institute of Technology; Duke Energy Corporation, "Carbon Tax as an Element of Tax Reform Agenda," available at http://comments.taxreformpanel.gov. A carbon tax is different from a Btu tax which was proposed by the Clinton Administration in 1993. The 1993 Btu tax would have applied to nearly all forms of energy (including nuclear and hydropower) based on the heat content of the fuel, without regard to their different levels of carbon and therefore without regard to their contribution, if any, to global climate change. In addition, the Btu tax was not designed to be revenue neutral; rather, it was intended to generate new revenues for deficit reduction.

[6] A number of European countries, including Finland, Sweden, the Netherlands and the UK, have both carbon or energy taxes and a cap-and-trade system.

[7] Climate Analysis Indicators Tool-US (CAIT US). 2006. Washington, DC: World Resources Institute. http://cait.wri.org

Question 2. Allocation
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Should the costs of regulation be mitigated for any sector of the economy, through the allocation of allowances without cost? Or, should allowances be distributed by means of an auction? If allowances are allocated, what is the criteria for and method of such allocation?

In this response we present a rationale for the following points:

1. Distribution of allowances is predominantly a political issue with significant economic implications.

2. Allocation by auction has considerable practical and theoretical strengths as opposed to free allocation. However, in most instances these have not been sufficient to overcome industry opposition.

3. As greater experience is gained with market-based systems, the appeal of an auction is probably increasing, due to both the difficulties with setting free allocations and the recent precedent set by the Regional Greenhouse Gas Initiative. The political and economic appeal of an auctioning approach will also depend on how the revenues are allocated.

4. If a free allocation is pursued, the allocation formula is shaped by five inter-related design variables that must be considered simultaneously.

Economic models offer some evidence that auctioning allowances and using the revenues to cut distortionary taxes is the most efficient and least expensive approach to implementing a market-based system.[1] Auctions may also allow the government to raise revenue for any number of purposes, including technology investments or deficit reduction. Furthermore, evidence exists that auctions tend to stimulate greater innovation than free allocations and may lead to more efficient investments in technology.[2] Real-world complexities, however, such as multiple distortionary policies, monopoly power, and differences among regulated firms, complicate the issue, making the optimal choice less clear.[3]

The white paper issued in February 2006 by Senators Domenici and Bingaman notes that an allowance auction has the benefits of avoiding some administrative costs as well as unintended competitive advantages, including windfall profits, for certain market participants. In addition, an allowance auction has the benefit of alleviating policy makers from the difficult and potentially costly task of attempting to design and negotiate an allocation method with imperfect knowledge.

In the cases of the United Kingdom Emissions Trading System (UK ETS) for greenhouse gases (GHGs) launched in 2001 and the European Union Emissions Trading System (EU ETS) for GHGs launched in 2005, government policy makers engaged in long, complex and difficult

negotiations with regulated firms over the method of allocation. However, on the critical issues being discussed, including emissions baselines, business-as-usual emissions growth and the technical feasibility of emissions reductions, the regulated firms were likely to have had better and more detailed information about their operations than their government counterparts. Likewise, for the costs of emissions abatement, government-funded modeling studies in the U.S. have tended to overstate the costs when compared to the actual prices of emissions allowances once trading begins,[4] probably due to overly pessimistic assumptions about the rate of technology innovation and deployment among regulated industry.

As a result, if a negotiation over free allocation of allowances is to occur, industry is likely to have the "upper hand." In the case of the UK ETS, preliminary research indicates that the program may have awarded excessive credits to companies that were reducing emissions anyway.[5]

In the case of the EU ETS, the first draft national allocation plan (NAP) that was issued came from the UK and was widely perceived to be stringent, meaning industry would not receive an excessive amount of free allowances. Subsequent to the UK proposal, however, other countries issued NAPs that were widely derided as being excessively generous to industry, even providing more allowances than would be needed under business-as-usual growth projections, thus setting a competitive disadvantage for companies in the UK. In response the UK altered its NAP by changing the assumptions for business-as-usual emissions growth, resulting in more free allowances for industry, particularly the prominent oil refining business. The EU experience thus illustrates the pressure that industry can apply in allocation negotiations as well as the complex and shifting analyses that are required to develop a "fair" method of allocation. Furthermore, the EU undertook an exhaustive analysis of marginal abatement costs across a huge range of industry sectors in a multi-year study that cost millions of Euros. The sectors it predicted as making major contributions to emission abatement (Germany's coal sector) were instead overtaken by facts on the ground (rising natural gas prices) while other sectors identified cheaper cuts than forecast.

Ironically, the ascendance of emissions trading in the 1990s as the preferred method of regulating air emissions was propelled in large part by the notion that market-based systems alleviated government regulators from the task of deciding how, where and when to make emissions reductions. In other words, one of the advantages of a market-based system over traditional "command and control" regulation is that it provides greater flexibility to industry and explicitly recognizes the inherent limitations of government agencies to fully know and understand all of the factors affecting the decisions to reduce emissions. This advantage helped bring about the U.S. acid rain program for sulfur dioxide (SO2) emissions trading as well as the state and federal trading programs for nitrogen oxides (NOx).

To establish methods for the free allocation of allowances, however, government policy makers appear to be putting themselves back into the morass that market-based is theoretically meant to alleviate. For GHG trading programs, the problem of limited and imperfect knowledge on the part of policy makers is particularly acute (as compared to SO2 and NOx) given that GHG emissions arise from so many sectors and sources. The EU ETS "downstream" allocation covers

11,000 installations, and this figure could have tripled if the EU had included the chemicals and aluminum sectors in its system. An allowance auction, however, avoids this problem.

Despite the many theoretical and practical advantages of an allowance auction, it has been used only sparingly to date, though this may be changing. The federal SO2 trading program in the U.S. uses a small annual auction of roughly 2 percent of the allowances, but this auction was designed simply to facilitate price discovery and market activity in the 1990s when emissions trading was still a novel concept. An allowance auction as a primary method for distributing allowances, however, has not been used and was recently rejected by EU countries when they launched their ambitious GHG trading program, presumably due to political pressures from industry.

During 2005-7, allocation of allowances in the EU ETS is about 6 billion tons of CO2, and as of December 2005 these represented a total asset value of around 130 billion Euro (US$153 billion).[6] If the U.S. were to launch a similar emissions trading system to cover downstream emissions from large point sources (power plants and industry, as is the case with SO2 and NOx), and this system had sufficient stringency to result in a $20 per tonne trading price, then the asset value of each year's worth of U.S. allowances could be on the order of $70 billion, or $700 billion over ten years.[7]

Given this magnitude, one can see how each industry and each special interest will seek to apply maximum pressure on government policy makers to distribute the allowances in its favor and free-of-charge – a bitter fight for the annual "rents" that is likely to impart high administrative costs and delays in implementation.[8] Indeed, the decision by the Federal Communications Commission to auction the telecommunications spectrum was based on such concerns.[9] Each industry and special interest may also be expected to use their proprietary information about their operations to their advantage and negotiate for a generous allocation of allowances despite the inefficiencies and distortions that would theoretically arise. The one regulated entity that is most likely to prefer an auction, new entrants into the system, may not be sufficiently organized (or even exist) to lobby for it.

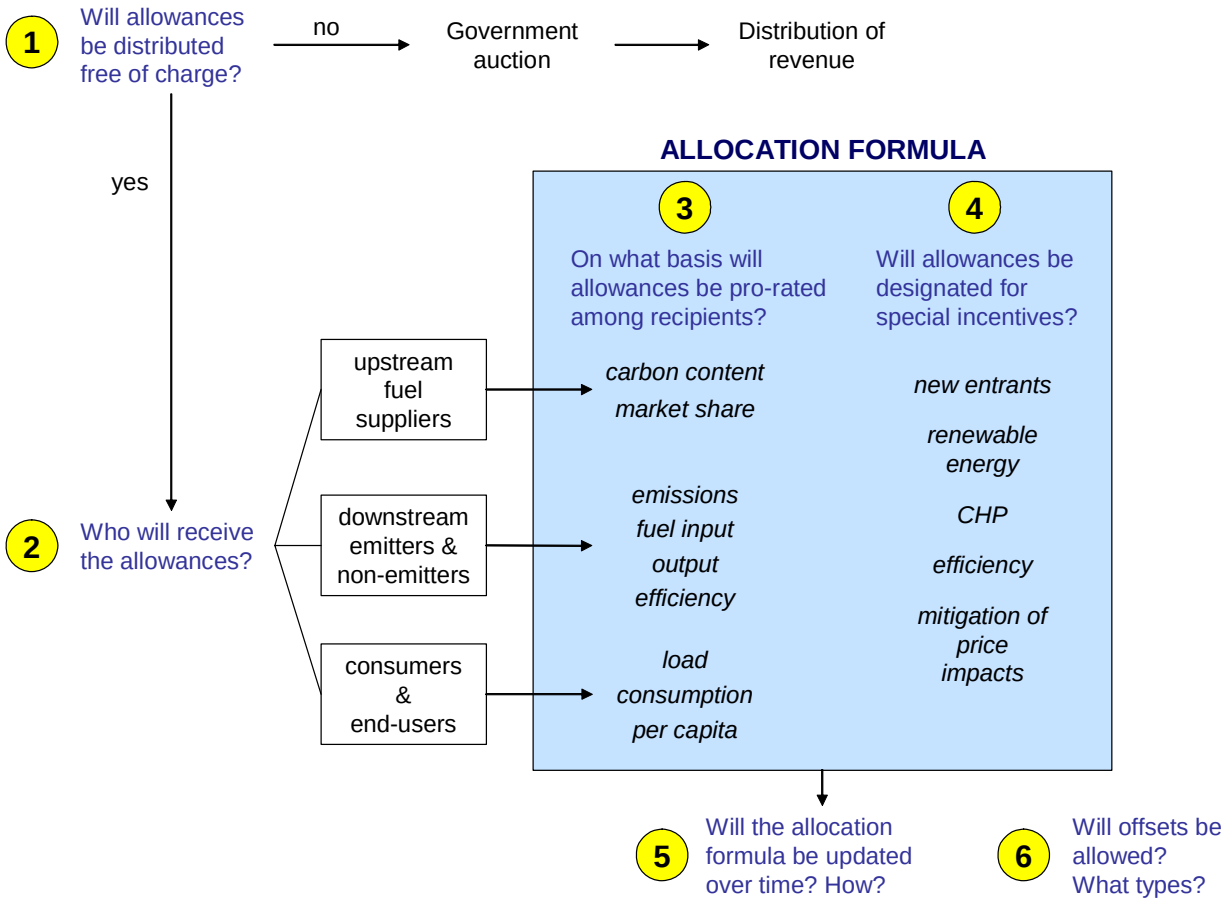
In contrast to the EU's reluctance to use an auction, the Regional Greenhouse Gas Initiative (RGGI) among seven Northeast states includes a potentially substantial auction. Each RGGI state will withhold a minimum of 25 percent of the allowances to be used for a "consumer benefit or strategic energy purpose," potentially including promotion of energy technologies, mitigation of electricity ratepayer impacts, and funding the administration of the program. Many of these allowances may be auctioned or otherwise sold by the states into the market. Such a large withholding from the allowance pool is groundbreaking and unprecedented among market-based systems. It may have resulted largely due to arguments and analyses made during the public stakeholder dialogue for RGGI that free allocations create a windfall for many regulated firms. Despite the large withholding, as much as 75 percent of the RGGI allowances may be allocated free of charge, so the distribution method is actually a hybrid.

For allowances that are free rather than auctioned, the options for distribution are complicated, and the optimal choice is not entirely clear. The white paper by Senators Domenici

and Bingaman identifies the major issues and rationales for allowance allocation. Perhaps the most complex aspect of allowance allocation is how these major factors are inter-related and even contingent upon one another. Figure 1 illustrates a series of six key decisions, or variables, that unfold in the process of choosing an allocation system, beginning with the question of free versus auction. If the decision is to distribute allowances free of charge, then a series of five inter-dependent variables unfolds:

- Who will receive the allowances?
- On what basis will the allowances be pro-rated among recipients?
- Will allowances be designated for special incentives?
- Will the allocation formula be updated over time?
- Will offsets be allowed into the trading system? (also applicable to an auction approach)

Figure 1: Simplified Decision Tree for Interdependent Allocation Variables



Free historical allocations for downstream emitters became the norm for U.S. market-based programs, including the SO2 program, the Ozone Transport Commission (OTC) NOx Budget Trading Program and the subsequent state-federal NOx SIP Call trading program.

On the surface, the much-heralded SO2 program had a simple allocation formula: allowances were given to downstream emitters (mainly power plants) based on their heat input rates. In the details, however, is an illustration of how allocation is an inherently political issue at the expense of economic efficiency and analysis. The SO2 allocations were subject to considerable political influence that resulted in myriad provisions and adjustments to the formulas, creating winners and losers among the states and the regulated firms, for example:[10]

- During the legislative process for the Title IV of the Clean Air Act Amendments of 1990, which gave rise to the SO2 trading program, congressmen from Illinois and Indiana were ranking member and chairman, respectively, of subcommittees with jurisdiction over Title IV. Also, the state with the highest SO2 emissions, Ohio, had two representatives on the House Energy and Power Subcommittee. These three states became recipients of "bonus allowances" totaling 200,000 tons annually, which at the time were estimated to be worth $50 million (on the low end); at current SO2 prices, these allowances are worth over $200 million.

- In response to requests from high-sulfur coal states, extension allowances were set aside in "Phase 1" to provide incentives for electric generating units (EGUs) to install qualifying pollution abatement technology (SO2 "scrubbers"). Coal producers argued that this incentive would help ensure a market for their product and keep coal miners employed. In the end, these allowances were allocated almost exclusively to high-sulfur coal-producing states in Appalachia and the Midwest, directly benefiting their power companies.

- When "Phase 2" of the trading program began in 2000, over 30 provisions for deviations from the baseline formula were included in the allocation scheme. For example, some of these provisions addressed equity arguments for special treatment of units that had unusually low emissions during the baseline year or were small units with few abatement options.

- There are at least ten provisions pertaining to Phase 2 allocation that single out specific states or specific utilities for bonus allowances. These provisions do not name specific beneficiaries but outline requirements that are so narrowly focused that they could only apply to a small group of regulated firms.

It should be noted that the allocation system for the SO2 program also included a set aside of allowances to reward investments in energy efficiency and renewable energy, known as the Conservation and Renewable Energy Reserve, or CRER. The set aside amounted to 300,000 allowances, or roughly 3% of the cap, but the program was significantly undersubscribed, or unused. The barriers to using CRER included low SO2 allowance prices, a low conversion factor for calculating the award, and restrictions on participation (utilities only).[11] Undersubscription

was also exhibited in the state set asides set up under the OTC NOx program.[12] Despite these early problems with set asides, though, they appear to be gaining favor with policy makers, as evidenced by various set asides in the EU ETS, the 25 percent allowance withholding in RGGI, and the increasing number and size of NOx set asides in the NOx SIP Call Trading Program.[13]

Turning to NOx allocation formulas more broadly, the details of how the OTC NOx allocation was determined varied from state to state, reflecting the political reality that a "one size fits all" approach was untenable and that allocation formulas had to be tailored by each state to its unique political and economic circumstances. For instance, some states based their allocation on heat input while others used output (megawatt-hours of generation). Some states had set asides for renewable energy or combined heat and power, while others did not. Delaware, New Hampshire, New York, Pennsylvania, and the District of Columbia had fixed allocations from 1999 to 2002. In contrast, Connecticut, Maryland, and New Jersey periodically adjusted their allocations according to various factors.

When the OTC program was eventually overtaken by the state-federal NOx SIP Call trading program, the practice of state-by-state allocation was continued. States that choose to participate in the NOx program are allowed to design their own allocation plan as part of their State Implementation Plan to help the state meet the federal air quality standards set by the Environmental Protection Agency.

Unlike the SO2 and NOx programs, the RGGI program is unique in that it also includes a provision for developing project-based emissions reductions, or "offsets," which occur outside of the regulated sector. An offset provision can be viewed as an adjunct to the allocation formula for a market-based system. For example, if a market-based system is designed to cover some sectors but not others, and therefore allowances are distributed to some sectors but not others, an offset mechanism could be used to provide incentives for emissions-reducing activities in the uncovered sectors. In other words, an offsets program is a means to integrating activities into a market-based system that otherwise do not fit within the allocation. To illustrate, RGGI will initially include the following offset types: landfill gas capture and combustion; sulfur hexafluoride capture and recycling; afforestation (transition of land from non-forested to forested state); end-use efficiency for natural gas, propane and heating oil; methane capture from farming operations; and projects to reduce fugitive methane emissions from natural gas transmission and distribution.

Implications for a U.S. federal system

Taking the experiences of existing market-based systems into account, several observations emerge. Distribution of allowances is predominantly a political issue – albeit one with significant economic implications. Allocation by auction has considerable practical and theoretical strengths as opposed to free allocation (grandfathering). However, in most instances these have not been sufficient to overcome industry opposition. As greater experience is gained with market-based systems, however, the appeal of an auction is probably increasing, due to both the difficulties with setting free allocations and the recent precedent set by RGGI. If a free allocation is pursued, the allocation formula is shaped by five inter-related design variables that must be considered

simultaneously. The political and economic appeal of an auctioning approach will also depend on how the revenues are allocated.

[1] Fullerton, D., and G. E. Metcalf. 2001. Environmental Controls, Scarcity Rents, and Pre-existing Distortions. *Journal of Public Economics* 80(2): 249–67. Goulder, L. H., et al. 1999. The Cost-Effectiveness of Alternative Instruments for Environmental Protection in a Second-Best Setting. *Journal of Public Economics* 72(3): 329–60.
[2] Kerr, S., and R. G. Newell. 2003. Policy-Induced Technology Adoption: Evidence from the US Lead Phasedown. *Journal of Industrial Economics* 51(3): 317–43. Milliman, S. R., and R. Prince. 1989. Firm Incentives to Promote Technological-Change in Pollution-Control. *Journal of Environmental Economics and Management* 17(3): 247–65. Popp, D. 2003. Pollution Control Innovations and the Clean Air Act of 1990. *Journal of Policy Analysis and Management* 22(4): 641–60.
[3] Babiker, M. H., et al. 2003. Tax Distortions and Global Climate Policy. *Journal of Environmental Economics and Management* 46(2): 269–87. Fischer, C., I. W. H. Parry, and W. Pizer. 2003. Instrument Choice for Environmental Protection When Technological Innovation Is Endogenous. *Journal of Environmental Economics and Management* 45(3): 523–45.
[4] For a discussion of SO2 prices and forecasts, see: Aulisi, A., et al. 2000. From Obstacle to Opportunity: How Acid Rain Emissions Trading Is Delivering Cleaner Air. New York, NY: Environmental Defense. For a discussion of NOx prices and forecasts in the Ozone Transport Commission NOx trading program, see: Aulisi, A., Farrell, A.F., Pershing, J., and VanDeveer, S. 2005. Greenhouse Gas Emissions Trading in U.S. States: Observations and lessons from the OTC NOx Budget Program. Washington, DC: World Resources Institute.
[5] D. Ellerman, personal communication, 2005.
[6] Presentation by Lars Olof Hoolner (European Commission), 2006.
[7] Based on EPA emissions data for U.S. GHG emissions in the year 2000, the total emissions for "Electric Power" and "Industry" were 3.731 billion metric tonnes. If the market price were $20 per tonne, this would amount to an asset value of $74.62 billion dollars annually. However, a hypothetical downstream system would not cover every source within the sector; small emitters are likely to be exempt.
[8] Cramton, P. and S. Kerr. 1998. Tradable Carbon Permit Auctions: How and Why to Auction Not Grandfather. Discussion paper 98-34. Washington, DC: Resources for the Future.
[9] Ibid
[10] For a complete description of the SO2 allocation system, see: Ellerman, D. et al. 200. Markets for Clean Air: The US Acid Rain Program. Cambridge, UK: Cambridge University Press.
[11] Wooley, D., E.M. Morss and J.M. Fang. 2000. The Clean Air Act and Renewable Energy: Opportunities, Barriers, and Options. Paper presented at the Association of Energy Service Professionals Conference. Golden, CO: National Renewable Energy Laboratory.
[12] Aulisi, A., Farrell, A.F., Pershing, J., and VanDeveer, S. 2005. Greenhouse Gas Emissions Trading in U.S. States: Observations and lessons from the OTC NOx Budget Program. Washington, DC: World Resources Institute.
[13] U.S. Environmental Protection Agency. 2005. Draft Report. State Set-Aside Programs for Energy Efficiency and Renewable Energy Projects Under the NOx Budget Trading Program: A Review of Programs in Indiana, Maryland, Massachusetts, Missouri, New Jersey, New York, and Ohio. EPA 430-R-03-005. Washington, DC: U.S. Environmental Protection Agency.

Question 3. International Linkage
Submitter's Name/Affiliation: Jonathan Pershing, World Resources Institute

Should a U.S. system be designed to eventually allow for trading with other greenhouse gas cap-and-trade systems being put in place around the world, such as the Canadian Large Final Emitter system or the European Union emissions trading system?

In this response we present a rationale for the following:

1. Linking emission trading systems is desirable where possible, but can be done successfully only where a number of conditions are satisfied.

2. These conditions are principally those of mutual confidence. Market participants need to have faith in the relevant monitoring, verification and legal regimes in each system. There is no need for an overlying institutional structure.

3. These criteria suggest that linking with emission trading systems in developed countries such as the European Union and Canada is both desirable and, depending on the design features chosen in a U.S. system, feasible. Conversely, for the foreseeable future the emergence of cap-and-trade systems in countries such as China and India that can be linked to a system in the U.S. is both implausible and potentially undesirable. The use of project-based mechanisms, however, may allow low-cost emission abatement options in these countries to be exploited.

Clarifying Question 3a:

- Do the potential benefits of leaving the door open to linkage outweigh the potential difficulties?

Linking with other emission trading systems is *a priori* highly desirable.

The same principle applies to emission trading as to other kinds of trade: the more the better. In particular, there are two main reasons to lean towards linking a U.S. emission trading system with foreign counterparts:

1. Economic

Many studies show that a wider group of participants in an emission trading system will tend to reduce the cost of meeting a given emission reduction target. This cost saving will be greatest where the participants face very different marginal abatement costs. For example, when the U.S. Ozone Transport Commission (OTC) designed a cap-and-trade program for NOx emissions, the primary target for regulation was electricity generators (the largest stationary source of emissions). The OTC decided to also include industrial facilities such as petroleum refineries and pulp and paper mills. These sources displayed flexibility in a wide range of compliance strategies.[1] Industrial sources became net sellers of allowances, suggesting that they had lower marginal control costs than electricity generators. By including industrial sources, the NO_x trading program was more flexible, achieved greater reductions in emissions, and lowered the overall program costs.[2]

Linking emissions trading systems internationally is likely to produce significant cost savings. The reason for this is straightforward, and underlies the rationale for all trade: different participants will face different costs of making cuts in the short, medium and long terms. Furthermore, these differences are extremely hard to identify in advance. The experience of the European Union is salutary: before implementing its Emission Trading System (ETS), the EU undertook an exhaustive analysis of marginal abatement costs across a huge range of industry sectors in a multi-year study that cost millions of Euros. The sectors it predicted as making major contributions to emission abatement (e.g., Germany's coal sector) have been overtaken by facts on the ground (rising natural gas prices) while other sectors have identified cheaper cuts than forecast. Inclusion of more players in more sectors helps to increase innovation while keeping costs down.

2. Political

Climate change is a global problem requiring international collaboration in finding solutions. The emergence of a clear U.S. policy that actively links to trading systems elsewhere will go a long way to reestablishing the U.S. as a leading participant in implementing climate solutions. Linking emission trading systems will also tend to equalize the abatement costs faced by American companies with those of their competitors in other participating countries such as

Europe and Japan, thus significantly reducing competitiveness concerns.

It is worth noting that the legislation implementing the EU emission trading system very specifically leaves the door open to links with other emission trading systems. Furthermore, the EU explicitly removed any reference to the Kyoto Protocol in its relevant text (the so-called "Linking Directive"[3]), thus signaling its willingness to link to any similar system that might emerge in the U.S.

Clarifying Question 3b:

- If linkage is desirable, what would be the process for deciding whether and how to link to systems in other countries?

Linking is possible even between quite different emission trading systems. The most important issues are not ones of strict harmonization but of mutual confidence.

The nuts and bolts of a market-based system are the monitoring and reporting of emissions inventories by the companies participating; the verification of these inventories by credible third parties; and recourse to a credible legal system that will enforce emission limits and punish fraud. These institutional underpinnings are, in one form or another, essential for any traded market. However, in the case of emission trading this importance is magnified because the very commodity being traded owes its existence to government mandate. If companies suspect that enforcement of the emission caps will be weak or that any government will be tempted to flout the rules by issuing surplus allowances, the incentive to use trading as a means of making cleaner investment decisions will be greatly diminished.

These factors are vital for establishing a functional market-based system, but in the U.S. and other developed countries some factors can be taken for granted. Linking to the EU ETS for instance means linking to a system in which the monitoring and verification are robust and the legal enforcement of caps is likely to be reliable. These conditions are less likely to be found in some developing countries or economies in transition (see discussion of "Emission trading systems in developing countries" below.)

Where this mutual confidence exists, most specific features of the systems do not need to be harmonized in order for a successful linking to be possible. The systems can cover different sectors, include different gases and employ different monitoring methodologies.

There are a few **essential** components that either need to be harmonized, or will be de facto harmonized automatically if systems are linked. These include compliance penalties, price caps and a common unit of exchange. If the two systems cover countries that engage in cross-border trade in electricity with each other, this imposes some design constraints.

There are some features for which harmonization is **helpful but not essential.** Differences in these features between systems can add significantly to cost and complexity, but do not preclude linking. Notable among these is the use of intensity targets.

Finally, some features present no technical difficulty but are so important that some degree of harmonization might prove **politically necessary.** The most significant issue here is the stringency of the regime.

Features that must be compatible:

Compliance

The most important aspect of two linked trading systems that needs to be coordinated is the compliance regime. In a linked system that combines different compliance regimes, the most lenient regime effectively applies to all.

The simplest way of applying an incentive to comply with emissions targets is to set a financial penalty for non-compliance. The EU ETS applies a financial penalty of 40 Euro (rising to 100 Euro from 2008) for each ton of CO_2 not covered by an EU allowance, as well as restitution of the excess emissions with an equivalent cut the following year.[4] If the EU were to link its scheme with one in which the penalty was only 10 Euro, then traders would ensure that emissions were matched with allowances in the EU and any non-compliance would migrate to the more lenient regime. In effect, the non-compliance penalty for the entire system would be 10 Euro.

This is fairly simple to see in the case of a fixed price penalty, but the complexity rises greatly for other forms of compliance and incentive mechanisms. In the case of the UK ETS,[5] participants who opted into the program were given an 80% reduction on their payments under the "Climate Levy" (a carbon tax). The penalty for non-compliance is the forfeiture of that reduction. In the case of the Danish CO_2 Quota Act, which only covers the power sector, a non-compliance financial penalty of DKK40 (around $6) per tonne of CO_2 applies, a relatively small sum. However, a Danish company in non-compliance also becomes ineligible to bid for government contracts – a far greater incentive to ensure compliance. However, while these compliance mechanisms may be effective within a single country and its trading system, they have no effect on companies in other countries. Therefore, if trading systems are linked, these compliance mechanisms do not cross over.

Price Cap

In the interest of limiting the cost of an emissions trading system, a debate arises over whether to use price caps on allowances prices. In the case of linked ETS, the lowest price cap that applies in any of the systems will effectively apply to all of them. The reason for this is similar to that for compliance penalties above: an efficient trading system will tend to equalize the price for all participants, and the option to buy more allowances at a given price will prevent the market price from rising above that level across the system. Consequently, price caps would have to be harmonized by policy makers; otherwise, the market would essentially harmonize the price caps automatically.

Traded electric power

Power generation can be covered in an emissions trading system either directly (by applying emission caps to generators) or indirectly (by allocating emissions to the consumers of the

electricity). A common way of dealing with power sector emissions is necessary if there is cross-border trade of electricity between the countries covered by the trading systems. This is necessary to avoid double-counting the emissions: once at the point of generation, and again at the point of consumption. Thus, trading systems in the U.S. and Canada, which have significant cross-border flow of electricity, would need to treat electricity in the same way, but the EU and the U.S. could afford to have separate approaches.

Features for which harmonization is helpful but not essential:

Beyond the short-list of essentials, there is a large number of features that can differ between linked systems. These differences may affect economic efficiency and/or environmental integrity, but do not necessarily preclude linkage. These have been explored extensively elsewhere,[6] but we highlight some of the most prominent issues here:

Use of absolute emission targets

In particular, a system based on intensity targets can trade with one based on absolute emission caps, but doing so adds greatly to complexity. The UK has experience with such linking, and this was due to the need to incorporate industry agreements based on intensity within a new emission trading system. A "gateway" was put in place to prevent inflation of emissions in those sectors covered by absolute caps. In order for trading between the two groups to take place, intensity performance is first converted into absolute tons of CO_2. These tons can then be traded, but the gateway prevents a *net* flow of emissions from the intensity-based sector into the sector covered by an absolute cap. These intensity-based metrics are being phased out in the UK.

Inclusion of project offsets

It is possible to exclude certain project types from one system that are allowed in another. For instance, the EU system allows the trading of credits from the Kyoto Protocol's Clean Development Mechanism (CDM), but this would not automatically mean that these credits could be traded into a U.S. system. In practice, however, an exclusion of the credits in a U.S. system would be notional only, as CDM credits could be used in the EU to "free up" allowances that could be traded into the U.S. system. Harmonization would thus increase transparency and efficiency, but not fundamentally affect prices or environmental integrity.

Registries

An electronic registry is needed to track the ownership of allowances within the trading system. Multiple registries can serve this function, but the more harmonization between them the better. However, it is worth noting that the EU member states are employing a number of different registries. Certainly, linking two trading systems would not require the merging of their registry.

Features that may be politically necessary:

Stringency

The relative stringency of the targets in each system does not affect the technical performance of the system but may preset a political obstacle to linking systems. In principle, linking two systems with widely diverging allowance prices could provide economic benefits to players in both systems. However, if the result of linking two systems is that there is a large net financial flow in one direction (and flow of allowances in the other direction), this may be politically challenging for both the "buyer country" and the "seller country."

For the buyer country, the political challenge may seem counterintuitive. After all, for companies in the more ambitious and expensive system their cost of compliance will go down (they will get cheaper allowances from the seller country). However, emission trading makes costs explicit, and experience in the EU suggests that governments attribute the costs to the emission trading system itself. Where these financial flows are from one country's companies to their international competitors, the system may be (negatively) perceived as a form of international subsidy. Also, the environmental community in the "buyer country" is likely to see the linking as undermining the integrity of their system.

For the seller country, the potential backlash to linking is clear. On its own, the seller country enjoys a relatively low cost of allowances – a reflection of the low stringency. As in any emissions trading system, some percentage of the regulated companies will choose to rely on the market and buy allowances as their primary strategy for compliance. If the system is linked to a more stringent and expensive trading program, however, the more stringent program will immediately begin drawing allowances from the other until the prices reach equilibrium. As a result, some of the companies in the less stringent system will be faced with higher compliance costs, and these costs may get passed on to their consumers. On the other hand, companies who were positioned to be sellers in the less stringent system would get a higher price for their allowances.

Clarifying Question 3c:

- What sort of institutions or coordination would be required between linked systems?

Linking emission trading systems needs very little in terms of process or supervision.

Assuming that the basic conditions of linking are met and there are no insurmountable political obstacles, the process itself is simple. The regulatory authority responsible for each system needs only to agree to recognize the allowances of the other for the purposes of fulfilling commitments with in its own system. This recognition does not even have to be mutual. This has already been proposed in the RGGI system: participants in RGGI are permitted, under certain circumstances, to surrender EU allowances against their obligations.[7] For this, no formal approval from the EU is necessary since any legal or natural person can hold EU allowances. A call to an emissions broker will be enough to secure a supply of allowances. Since anyone can buy EU allowances, the EU did not itself have to be involved in this decision. However, efficiency and political cooperation will be best served in the future by mutual recognition.

In the period to 2012, the recognition of U.S. allowances in the EU (or any other party to the Kyoto Protocol) is more complex. The EU ETS contributes directly to the compliance of EU countries with their Kyoto targets. EU allowances are "tracked," or mirrored, by so-called "assigned amount units" (AAUs), the emissions trading currency under the Kyoto Protocol. Allowances bought from a U.S. system would not provide such AAUs and would compromise the ability of EU countries to meet their obligations under the Kyoto Protocol. In the longer term this problem need not apply.

As this suggests, linking emission trading systems does not imply the creation of new governing bodies or other oversight. The essential ingredient is confidence in each country's monitoring, verification and legal systems. In practice this is likely to restrict such linking in the first instance to systems in OECD countries, but this can be evaluated on a case-by-case basis. In practice, a simple memorandum of understanding between the respective regulating bodies could be all that is necessary.

Emission trading systems in developing countries

The white paper by Senators Domenici and Bingaman refers to "a trading system that includes emission reductions in key developing countries such as India and China" as a desirable objective. This formulation covers a number of potential options, but here we will briefly discuss the application of market-based system in these countries. There is little prospect of implementing an ETS in either India or China for the near future, although there are clear prospects for engaging with these countries on meaningful emission reductions[8]. The barriers to implementing an ETS in China or India are technical, institutional and political.

From the technical point of view, emissions in developing countries are growing at a pace too

rapid and unpredictable to form the basis for enacting a Kyoto-style "cap" on national emission levels.[9] For example, models project that India's emissions in 2025 will be somewhere between 73 and 225 percent above today's levels. In China, the difference between the low and high estimates of emissions growth (50 and 181 percent, respectively) amounts to 1,025 million tonnes of carbon, a quantity that exceeds the combined current emissions of India, South Korea, Mexico, South Africa, and Brazil.[10] Under conditions of such uncertainty, at what conceivable level would a country "cap" its emissions? Formulating caps under this level of uncertainty amounts largely to a guessing game with enormous environmental and economic consequences.[11] The uncertainty problem, however, is much less acute in industrialized countries (many of which are already implementing fixed targets under the Protocol), where underlying economic conditions are more stable and can be more accurately forecasted.[12]

Second, the institutional, legal and technical capacities discussed above may not exist in many developing countries. New laws and regulations that cover the entire economy may be needed. Countries must have the ability to exercise regulatory control over their private and public entities and must apply appropriate sanctions in cases of non-compliance.[13] Perhaps most significantly, credible emission caps require quantitative precision, and thus high-quality monitoring tools and robust national GHG inventories that are developed in accordance with international standards. This would be a major challenge as, to date, almost all developing countries have reported difficulty in compiling their emissions inventories under the United Nations Framework Convention on Climate Change.[14]

Politically, India and China have made clear on numerous occasions[15] that they are not prepared to take on emission caps. It is true that one reason for this has been the reluctance of the U.S. to commit to reductions itself, but even a shift in US policy should not be expected to change policy in India or China in the near term. These countries point to their far lower levels of economic development and far lower per-capita emissions[16] as a reason for this reluctance. Most hopes for engaging them in an ETS spring from the idea of allocating surplus allowances (so-called "hot air") as an inducement. Experience with this approach, which was used to bring Russia and other post-Soviet economies into the Kyoto Protocol, is not promising. The political prospect of "reaching" climate goals by making large financial transfers to Russia is not one that appeals to many Kyoto Parties, and it is unlikely to be much more tempting in the case of China.

It is important to stress that this does not mean that emission abatement potential in these countries cannot be harnessed. In many cases, project offsets similar to the Clean Development Mechanism of the Kyoto Protocol can realize low-cost emission abatement and the credits can be used to lower compliance costs in an ETS. For larger-scale changes in developing country development pathways, policy reform is necessary. For such reforms, a carbon price may not be the most useful signal, and other methods of policy-focused engagement are more promising.[17]

Implications for a U.S. federal system

There are both political and efficiency reasons to design a system with an eye to potential linkage to other systems. Some decisions made in the design of a domestic US system can help or hinder the potential for such linkages. A simple compliance system based on financial penalties and the use of absolute emission targets are examples of features that make linking easier. Successful linkage will depend in large part on mutual confidence in the monitoring, verification and legal capacities underpinning each system. This will tend to make links to other industrialized systems more promising. It is doubtful whether such systems in major developing countries such as China and India are a realistic near-term prospect.

[1] Compliance strategies included switching to cleaner fuels, modifying production processes, replacing boilers, modifying combustion, installing control technologies, and retiring or deferring units. U.S. Environmental Protection Agency (EPA). 2004. Industrial Source Participation in the OTC NOx Budget Program. Washington, DC: U.S. EPA Office of Air and Radiation.

[2] Aulisi, A., Farrell, A.F., Pershing, J., and VanDeveer, S. 2005. Greenhouse Gas Emissions Trading in U.S. States: Observations and lessons from the OTC NOx Budget Program. Washington, DC: World Resources Institute.

[3] Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms

[4] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission trading within the Community and amending Council Directive 96/61/EC.

[5] See http://www.defra.gov.uk/environment/climatechange/trading/uk/pdf/trading-rules_rev2.pdf for the rules of the UK ETS. These rules were given statutory force in the Waste and Emissions Trading Act 2003.

[6] Haites, E., Mullins, F., 2001. Linking Domestic and Industry Greenhouse Gas Emission Trading Systems, EPRI, International Energy Agency (IEA) and International Emissions Trading Association, Paris

[7] To be precise, using outside credits such as EU allowances is only permitted if the market price for carbon averages more than $7 per allowance over a 24 month period.

[8] In 2005 WRI undertook a substantial analysis of policy-based approaches to cutting emissions in developing countries. See Bradley, Rob & K.A. Baumert. 2005. *Growing in the Greenhouse: Protecting the climate by putting development first*. Washington, DC: World Resources Institute, *available at*: http://climate.wri.org/growingingreenhouse-pub-4087.html

9.*See* Yong-Gun Kim & Kevin A. Baumert, *Reducing Uncertainty Through Dual-Intensity Targets*, *in* BUILDING ON THE KYOTO PROTOCOL: OPTIONS FOR PROTECTING THE CLIMATE 109, 129 (Kevin A. Baumert et al. eds., 2002) ("Negotiating emission controls is challenging precisely because of pervasive uncertainties: Countries do not actually know what they are agreeing to.").

10 Data in this section are from Navigating the Numbers, a comprehensive effort undertaken by WRI to evaluate a wide range of indicators, as well as their implications for target-setting. *See* Baumert, K.A., T. Herzog, and J. Pershing. 2005. *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy*. Washington, DC: World Resources Institute, *available at*: http://climate.wri.org/pubs_description.cfm?PubID=4093.

11.With respect to the environmental outcomes, guessing wrongly on a target level would have considerable implications. If the target is set too loosely it will have no environmental benefit. Such a target might even weaken the environmental outcome of the treaty in the event that excess emission allowances are transferred to other countries through Kyoto's international emissions trading provisions. In other words, the environment might be better off if the country had never taken a target to begin with. On the other hand, if the target is set too stringently (i.e., too few emissions are allowed), it may constrain economic development or, alternatively, lead to treaty non-compliance or target renegotiations. Given their aversion to risk, developing country governments are likely to avoid emission targets that have the potential to adversely affect economic growth, even if that potential is remote. *See generally* Kim & Baumert, *supra* note 9.

12.Baumert et al., *supra* note 10.

13.Willems S. & Baumert K., 2003, *Institutional Capacity and Climate Actions*, OECD/IEA, Paris, at 25–26.

14.U.N. Framework Convention on Climate Change, Subsidiary Body for Implementation, 17th Sess., New Delhi, India, Oct. 23–29, 2002, *Fourth Compilation and Synthesis of Initial National Communications from Parties Not Included in Annex I to the Convention*, 28, U.N. Doc. FCCC/SBI/2002/16 (Oct. 1, 2002) (noting that almost all Parties reported difficulties stemming from the lack of quality data, lack of technical and institutional capacity, and problems related to methodologies), *available at* http://unfccc.int/resource/docs/2002/sbi/16.pdf.

[15] These positions were restated most recently in the addresses of China and India to the G8 Summit at Gleaneagles in July 2005.

[16] In 2002 the average American emitted 6.9 times more CO_2 than the average Chinese, and 18 times more than the average Indian. Climate and other relevant data are freely available online through WRI's Climate Analysis Indicators Tool: http://cait.wri.org

[17] See for instance Bradley & Baumert, *supra* note 8.

Question 4. Developing Country Participation
Submitter's Name/Affiliation: Jonathan Pershing, World Resources Institute

If a key element of the proposed U.S. system is to "encourage comparable action by other nations that are major trading partners and key contributors to global emissions," should the design concepts in the NCEP plan (i.e., to take some action and then make further steps contingent on a review of what these other nations do) be part of a mandatory market-based program? If so, how?

In this response we present a rationale for the following:

1. There is no single metric for evaluating relative efforts of different countries, although there is a range of metrics that can throw light on the question.

2. The United States has long accepted the principle of "differentiated" responsibilities in dealing with climate change. Given the widely varying national circumstances among countries, the appropriate consideration is whether international partners are taking *appropriate* levels of action rather than *equal* levels of effort to the United States.

3. While making part of United States policy formally *contingent* on specific actions in other nations would be counter-productive, formal or informal review of relative efforts are a normal part of international negotiations. The United States has several plausible options for providing incentives to developing countries to take action on GHG emissions

Climate change is a global problem. Accordingly, the U.S. should consider the efforts being made by other countries to limit GHG emissions as a relevant consideration in formulating its own response to climate change. Dangerous human-induced climate change cannot be avoided without significant participation of the major-emitting countries (Table 1). The 12 highest-emitting countries comprise 75% of global emissions (taking the European Union as a single entity). These countries also account for 77% of U.S. exports and an equal share of U.S. imports.[1] Focusing on the individual and collective efforts of these countries should be an important consideration of the U.S. government.

It is not necessarily the case, however, that all countries should be expected to undertake an equal level of effort or equal emission reductions. The U.S. has long supported the view that national responses should be "differentiated" according to national circumstances faced by different countries, and that some countries should be expected to contribute greater efforts than others. This principle is embodied in the 1992 Climate Convention,[2] which has been ratified by the U.S. with unanimous support from the Senate.

Table 1. Top Greenhouse Gas Emitting Countries (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6)

Country	$MtCO_2$ equivalent	% of World GHGs
1. United States	6,928	20.6%
2. China	4,938	14.7%
3. EU-25	4,725	14.0%
4. Russia	1,915	5.7%
5. India	1,884	5.6%
6. Japan	1,317	3.9%
7. Brazil	851	2.5%
8. Canada	680	2.0%
9. South Korea	521	1.5%
10. Mexico	512	1.5%
11. Indonesia	503	1.5%
12. Australia	491	1.5%
Rest of World	**8,401**	**25%**
Sources & Notes: World Resources Institute, Climate Analysis Indicators Tool (CAIT, v. 3.0). Totals exclude emissions from international bunker fuels and land use change and forestry. 2000 data.		

An evaluation of relative efforts across countries is not simple (see response to 4a). Likewise, how the U.S. establishes its actions as "contingent" on the actions of others will need to take into account the realities of international cooperation on such a complex issue (see response to 4b). On a positive note, the United States has several plausible options for providing incentives to developing countries to take action on GHG emissions (see response to 4c).

Clarifying Question 4a:

- What metrics are most valuable for comparison of developed and developing country mitigation efforts to U.S. efforts?

There is a series of metrics and indicators that, when taken together, enable reasonable comparisons to be made across countries. These metrics are both quantitative (e.g., emissions indicators) and qualitative (e.g., policies adopted).

However, international comparisons are fraught with challenges. For instance, it is not even obvious what it is that should be compared. The domestic mitigation *efforts* of a country, the *results* of those efforts, the efforts at helping *other countries*, and the overseas results achieved all seem to be relevant criteria when making cross-country comparisons.[3] Likewise, some policy actions (e.g., carbon tax) will result in *immediate* effects, whereas others (e.g., R&D) are expected to bear fruit over decadal timescales. Further complicating matters is that, as explained above, not all countries are expected to undertake the same level of efforts (or results). In particular, there is broad international consensus that those poorer countries with less financial, technological, and administrative capacities are not expected to expend the same amount of effort as other countries that have contributed to the build-up of GHGs in the atmosphere and have the financial and technological means to rein in emissions.

Recognizing the complexities, it is clear that no single metric alone can adequately capture the relative mitigation efforts. Accordingly, a basket of metrics should be considered together when attempting to make even-handed comparisons across multiple countries. A few of the most important indicators are discussed below. The indicators and observations below are drawn from WRI's Climate Analysis Indicators Tool[4] and the 2005 WRI report *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy.*[5]

A. Emissions Indicators[6]

1. Absolute GHG Emissions (six gases)

The absolute emissions indicator is important for two reasons. First, it is a measure of each country's marginal (i.e., annual) contribution to the atmospheric buildup of GHGs. Second, it is a measure that near-term policies and technological innovations can influence. Accordingly, country-level changes in absolute emissions should be evaluated *over time*. Attempts to evaluate the effects of a specific measure may call for the use of sectoral rather than national data (e.g., transportation, electric power, agriculture, etc.) (See Indicator 4 below).

2. GHG Emissions Per Capita

GHG emissions per capita is a useful indicator because it measures *relative* emissions. Looking only at absolute emissions (Indicator 1, above) may be misleading, particularly when making evaluations between developed and developing countries. Some developing countries,

such as India, may have high absolute emission levels (5th in the world), but low emissions per capita (140th). For these countries, reductions in absolute emissions (Indicator 1) are very unlikely *even under aggressive emission reduction policies*. The reason is that most individuals in India do not yet have access to modern electricity and transportation services. Thus, cleaner development may restrain emissions growth, but not necessarily lead to an absolute decline in emissions.

Useful insights may be gained by examining changes in GHG emissions per capita *over time*. Many factors influence changes in absolute emissions (Indicator 1), including population growth, economic growth, changes in energy fuels, and changes in economic activities (e.g., shift toward services). Per capita trends over time control for the effect of population growth on emissions growth. For example, one factor that explains why U.S. emissions have consistently grown faster than Europe's is the U.S. population is growing at about four times the rate of Europe's.[7] Comparing absolute and per capita growth rates can reveal this effect.

3. CO_2 Intensity of Economy

CO_2 intensity is emissions per unit of activity (e.g., gross domestic product [GDP], at the national level). This indicator is a function of a country's fuel mix (CO_2 per unit energy) and energy intensity (energy per unit GDP). Energy intensity, in turn, is a function of energy efficiencies and economic structure (e.g., an economy dominated by heavy industrial production would likely have a higher energy intensity than one where the service sector is dominant).

CO_2 intensity is useful for two reasons. First, over time, this indicator is *not* driven heavily by economic and population growth (unlike Indicator 1). Second, the factors that do drive changes in CO_2 intensity—namely, fuel mix and energy efficiency—are important policy targets. Thus, examining trends in emissions intensity should reflect progress (or lack thereof) in these important areas. It should be noted, however, that even in the absence of climate change policy, this indicator tends to naturally decline in many countries, for example, due to technological development and shifts away from energy-intensive production processes, which has been the experience in the Untied States.

4. Sectoral and Fuel Indicators

Depending upon the policy being assessed, there are a range of other useful indicators. Examples include:

- If policy efforts are aimed at shifting away from coal and oil consumption nationwide, an important indicator would be the carbon intensity of fuel supply (CO_2 emissions per unit of energy consumption).

- If policy efforts are targeted at motor vehicle efficiency, then CO_2 emission trends in the transport sector should be evaluated, including both absolute and per capita trends.

5. Energy Consumption Per Capita

This indicator is important for reasons similar to GHG per capita, however it also provides some additional context because energy use in many countries is the largest source of GHG emissions. Other factors held constant, countries with high energy use may be more capable of reducing GHG emissions through policy interventions compared to those countries with low levels of energy use. This is due in part to the differing penetration rates of energy-intensive goods, particularly across North-South lines. In many developing countries, the penetration of refrigerators, air-conditioners, televisions, computers, automobiles, etc.—all of which require energy—is low compared with industrialized countries. As societies develop, it is expected that energy use will increase, even in the context of climate policy interventions. However, the degree to which expanded energy consumption increases *emissions* will depend upon the carbon intensity of the fuel supply (see Indicator 4).

B. Socio-Economic Indicators

These metrics, while less useful for comparing actual emissions efforts, do provide critical context for evaluating national circumstances – which in turn aids in assessing the appropriateness of climate programs being adopted and implemented.

6. Gross Domestic Product (GDP)

GDP—the aggregate level of economic activity within a country's borders—is important because it is a major driver of GHG emissions. Accordingly, changes in GDP over time can be an important variable in explaining changes in emission levels (Indicators 1 and 2). For example, it may be difficult to detect the effect of strong emission-reduction policies in the context of very rapid economic growth (e.g., China). Alternatively, some countries may have declining emissions due to economic recession even though they are making little effort to restrain emissions (e.g., Russia and Ukraine). Thus, GDP shifts can provide essential context for understanding absolute emissions shifts.

7. GDP Per Capita

GDP per capita (i.e., income levels) provides a reasonable, though imperfect, measure for comparing levels of economic development. GDP per capita is a crude proxy of financial, administrative, and technical capacity within a country. Low-income countries also tend to have low education levels, significant public health problems, and relatively poor governance capabilities. Accordingly, those countries with very low levels of income cannot reasonably be expected to expend the same level of effort and financial commitment to climate protection as those countries with high income levels.

C. National Policies

Quantitative metrics, such as those discussed above, are only conducive to assessing (1) the macro effects of climate policies (or lack thereof) and (2) the level of effort on climate policy

that countries should reasonably be expected to undertake. Quantitative indicators do not measure the level of effort on climate policy that a country *actually undertakes*. To gauge actual efforts, it is necessary to assess the actual policies and measures adopted. In making these assessments, WRI recommends the consideration of the following factors that, when taken together, provide a basis for comparative assessments.

1. Form of Action. This may include the following:
    a. *Fiscal Measures*. Taxes (including exemptions, credits, etc.), fees, etc.
    b. *Market and Regulatory Measures.* Cap and trade, mandates (products, processes), standards, sectoral regulatory reforms (e.g., electricity), product labeling, etc.
    c. *Industry Agreements*. Corporate challenges, public-private partnerships, etc.

2. Stringency/Magnitude of Action. What level of effort is required under the particular measure? E.g., level of emission target, size of tax or subsidy, stringency of technology or performance standard, etc.

3. Legal Character. Are the policies and measures mandatory? If so, what are the accountability provisions with respect to reporting and review of compliance?

4. Scope of Action. What sectors, processes, or fuels are covered? E.g., energy production, buildings, industry subsectors, transportation, waste, forestry, agriculture, etc. What share of a country's emissions do the policies and measures cover? Scope of action can also be international, in that they are aimed at assisting other countries, in particular developing countries (e.g., through aid, export credits, etc).

5. Status. Is the measure planned or already enacted?

The above classifications provide a starting point for making meaningful comparisons. Once policies and measures are classified, additional considerations include:

- Given that countries are not all capable of, or are expected to, perform equally, how much effort should a given country reasonably be expected to undertake?

- Across what timescales should efforts be evaluated? Should policies that result in certain and immediate emission reductions be weighted more heavily than policies that may result in longer term reductions?

- How to compare stringencies across different forms of policy actions (e.g., technology standard versus an emissions cap)?

Accessing National Policy Information

There is a large literature on national climate policies, although in many cases up-to-date information requires gathering information directly from national sources. However, there are also several international sources that compile information on multiple countries, including the following:

1. National Communications. The most comparable repository of climate change policies and measures enacted by governments can be found in the National Communications to the Climate Change Convention. Each National Communication includes a section describing the policies and measures countries have adopted to reduce GHG emissions. These reports are submitted approximately every three to four years by Annex I (industrialized and transition) countries, including the United States. One major shortcoming of these reports is their poor coverage of developing (non-Annex I) countries. These reports are available from the Convention Secretariat at: http://unfccc.int/national_reports/items/1408.php.

2. International Energy Agency (IEA) Policies and Measures Database. The IEA maintains a database of climate change policies and measures that are planned or adopted by IEA member countries (including the U.S.). This database can be queried by a range of criteria, including country, year (of policy/measure), policy type (e.g., fiscal, regulatory), sector, and energy source. The database is high quality, but has several limitations, including that it is limited to IEA member countries and includes only *energy-related* policies and measures. The database can be accessed at: http://www.iea.org/textbase/pamsdb/search.aspx?mode=cc.

3. WRI Draft SD-PAMs Database. Modeled on the IEA database, WRI is in the process of developing a database that details the policies and measures planned or adopted in selected *developing countries*. In addition to "climate-specific" actions, the database includes so-called sustainable development policies and measures (SD-PAMs); i.e., policies, programs, regulations or other measures implemented that aim to achieve national or local goals but that have a beneficial effect on the climate by reducing emissions of greenhouse gases. The database covers measures from a range of sectors, including building efficiency, energy production, industry, transport, agriculture, and forestry, and can be queried by country, policy type, sector or motivation. Although currently in draft form, the database is a useful tool for identifying the efforts that developing countries are taking toward reducing their emissions. The draft database can be accessed at: http://cait.wri.org/sdpams

Clarifying Question 4b:

- What process should be used to evaluate the efforts of other nations and how frequently should such an evaluation take place?

There are a variety of means through which the United States should evaluate the efforts of other countries, including the following:

1. Comparison study

As discussed in the response to 4a, cross-country evaluations are not simple. There is no ready formula that can be used to make balanced international comparisons. Accordingly, a competent government agency could be tasked with undertaking a study involving the top 12-15 emitting countries (e.g., those shown in Table 1). This study should also include an evaluation of the United States' domestic actions and international efforts.

2. International negotiations

Intergovernmental negotiation processes regularly evaluate—formally or informally—relative efforts across countries. Indeed, this is a normal feature of international negotiations on trade, arms control, and environment, among others. For example, NATO's "burden-sharing" exercise involved "targets for national military participation, conscription of soldiers, investments in equipment, contributions to military infrastructure and real estate, and so on . . . . [T]he process was one of reciprocal scrutiny and cross-examination, with high-level officials spending months negotiating."[8]

Prior to adopting domestic commitments, the United States should develop an understanding of the relative efforts of other countries. However, because the United States has contributed more than any other country to the buildup of CO_2 and other GHGs in the atmosphere, there is a widely-held expectation that the U.S. should take a leadership role in the international efforts to address GHG emissions. To date, the perceived lack of action by the U.S. has been used by some countries to forestall their own efforts on GHG abatement.

Along these lines, the United States should be very cautious about establishing criteria that other countries should meet as a condition for U.S. action. For example, in the 1997 Byrd-Hagel Resolution the U.S. Senate insisted that, as a condition of U.S. participation in a climate treaty, developing countries must adopt "specific scheduled commitments to limit or reduce GHG emissions … within the same compliance period" as the commitment of the United States.[9]

Rather than enhancing U.S. bargaining power, the resolution was perceived as unreasonable by most governments and contrary to the Climate Convention—under which the United States and other industrialized countries promised to "take the lead in combating climate change."[10] The perception created by the Byrd-Hagel resolution was that the United States was not serious

about dealing with climate change. In this context, the resolution gave developing countries good reason *not* to take stronger measures to rein in emissions.

These kinds of legislative or policy formulations should be avoided in the future, as they have harmful, if unintended, foreign policy effects. Prior to adopting extra-territorial "conditions" on other countries, the United States should consider a "reciprocity test": what would be the U.S. reaction, for instance, to a provision adopted by the Indian Parliament which conditioned Indian actions on those of the United States? Such measures are not a constructive way of addressing climate change and therefore should be discouraged by the United States and other countries. A more fruitful process is one where the United States engages in international negotiations and, to support those negotiations, undertakes even-handed evaluations of the efforts of all major emitting countries (including the United States itself). In the ensuing legislation, the form and stringency of U.S. actions adopted should be informed by the efforts of other countries. Experience suggests, however, that making U.S. action contingent upon the actions of other countries can be counter-productive for all parties.

Clarifying Question 4c:

- Are there additional incentives that can be adopted to encourage developing country emission reductions?

Yes. There are a number of measures that the United States can take to incentivize developing country emission reductions, including the following:

1. Crediting Mechanism

A U.S. emissions trading program could recognize emission reductions achieved in developing countries. For example, if a U.S. company invests in an industrial facility in Mexico that results in GHG emission reductions, and those reductions are verified by a third party, U.S. legislation could allow those emission reductions to be credited against the obligations of a domestic source. Such a program would have the dual advantage of promoting emission reductions in developing countries while also reducing compliance costs to U.S. companies. Presently, the European Union has such a provision in its Emissions Trading System.[11] WRI together with the World Business Council on Sustainable Development have developed guidance on how such project mechanisms can be made to work effectively[12].

2. Export Credits

The U.S. government routinely supports private domestic companies with preferential trade financing (e.g., loans of short-term maturity) for the export of equipment or services. (These and other financial services are provided through the Export-Import Bank of the United States and the Overseas Private Investment Corporation.) "Greening" the U.S. export credit portfolio and supporting international environmental standards—including GHG standards—governing all export credit agencies could significantly further emission reduction efforts in developing countries.[13]

3. Removal of Trade Barriers

The United States can work with other countries—particularly developing countries to reduce trade barriers to clean energy technologies and services. This involves removal of barriers imposed by other countries, as well as the United States' own barriers to the clean energy exports of other countries. For instance, the United States prevents Brazilian ethanol from entering the domestic market by levying a 54-cent per gallon tax on imports.

4. Clean Technology Development and Diffusion

Certain clean technologies, if developed in the United States, are likely to diffuse to developing countries through market forces, resulting in emissions savings. This is particularly true for products that are widely tradable, such as motor vehicles.[14] Most motor vehicles are produced (and sold) in industrialized countries by a relatively small number of manufacturers.

Developing countries, on the other hand, tend to rely on either imports or licensed production. Under these conditions, technology diffusion can be surprisingly quick, as exemplified by the spread of catalytic converter technologies. An essential prerequisite for such diffusion, however, is that the United States (and preferably Europe and Japan as well) needs to adopt clean technology standards for various products, such as automobiles.

Other technology options, such as carbon capture and storage (CCS), also hold promise. To achieve market penetration, however, this technology will likely need to be developed in the United States (and perhaps other industrialized countries) with financial support to promote developing-country uptake. The reason is that there are virtually no development benefits to adopting CCS technology. For the foreseeable future, developing countries will be focused on providing electricity *access* to their populations, rather than devoting scarce resources to CO_2 capture and storage.[15]

5. Aid and other Financial Assistance

The U.S. foreign assistance already includes programs to reduce GHG emissions in developing countries. These come in the form of bilateral assistance and multilateral assistance (e.g., the Global Environment Facility). These efforts can be maintained and strengthened.

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By reinvigorating existing initiatives above and launching several new ones, the United States could contribute substantially to greening financial flows to developing countries and promoting clean technology transfer.

To be most effective, as discussed above, initiatives should be targeted at the major developing countries, in particular China and India. These two countries comprise 38 percent of the world's population—almost as much as all other developing countries combined. These two countries, which already have fast-growing middle classes, will soon demand energy and transport services resembling those of the developed world. Ensuring that those services can be delivered in a low-carbon context is perhaps the biggest challenge to restraining global emissions over the coming decades.

[1] World Trade Organization. 2005. *World Trade Statistics*. Geneva. *See* Table III.16. Other economies (not shown in Table 1) that comprise a significant share of U.S. exports are Taiwan (2.7%), Singapore (2.4%), and Hong Kong (1.9%).
[2] Article 3, United Nations Framework Convention on Climate Change (UNFCCC). 1992. *Available at*: http://unfccc.int/resource/docs/convkp/conveng.pdf.
[3] *See* Philibert, C. 2005. Climate Mitigation: Integrating Approaches for Future International Cooperation. Annex I Expert Group to the UNFCCC. Paris: OECD/IEA.
[4] Climate Analysis Indicators Tool (CAIT) version 3.0. 2006. Washington, DC: World Resources Institute. Available at http://cait.wri.org.

[5] In 2005, WRI undertook a comprehensive effort to evaluate a wide range of indicators. *See* Baumert, K.A., T. Herzog, and J. Pershing. 2005. *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy*. Washington, DC: World Resources Institute, *available at*: http://climate.wri.org/pubs_description.cfm?PubID=4093.
[6] Data on all of the indicators described can be accessed free of charge from WRI's Climate Analysis Indicators Tool (CAIT) (http://cait.wri.org). CAIT includes data for all countries, all greenhouse gases, and all major economic sectors.
[7] *See* Baumert et al., *supra* note 5, at 23 (analyzing effects of population growth on U.S. and EU CO_2 growth over the 1990 to 2002 period).
[8] Schelling, T.C. 2002. "What Makes Greenhouse Sense?" *Foreign Affairs*. May/June.
[9] S. Res. 98, 105th Cong. (1997).
[10] *See* UNFCCC, *supra* note 2, at Art. 3.1.
[11] This link was established through Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms.
[12] Greenhouse Gas Protocol: The GHG Protocol for Project Accounting. Available at http://climate.wri.org/ghgprojectaccounting-pub-4039.html
[13] *See* Harmon, J., C. Maurer, J. Sohn and T. Carbonell. 2005. *Diverging Paths: What future for export credit agencies in development finance?* Washington, DC: World Resources Institute, *available at*: http://climate.wri.org/divergingpaths-pub-3930.html; and C. Maurer with R. Bhandari. 2000. *The Climate of Export Credit Agencies*. Washington, DC: World Resources Institute, *available at*: http://climate.wri.org/climateexportcreditagencies-pub-3005.html.
[14] *See* Baumert, K., C. Dasgupta, and B. Müller. 2003. "How Can the Transatlantic Partners Help in Addressing Developing Country Emissions?" *in* A. Ochs and A. Venturelli (eds.), *Towards Transatlantic Consensus on Climate Change*.
[15] *See* Mwakasonda, S. and H. Winkler. 2005. "Carbon Capture and Storage in South Africa" *in* R. Bradley and K. Baumert (eds.), *Growing in the Greenhouse: Protecting the Climate by Putting Development First*.